Nutrition

A Priority in African Development

Edited by
BO VAHLQUIST

THE DAG HAMMARSKJÖLD FOUNDATION
UPPSALA, SWEDEN

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Introduction

By BO VAHLQUIST*

Nutrition may be defined as a discipline which has as its objective to direct attention to the food needs of individuals or groups of individuals and to formulate and institute intervention procedures in case of need. Interest in this field has arisen from the growing awareness that neither an increase in food production alone nor an increase in the GNP will automatically solve the nutritional problems of a country.

Nutrition as a science is fairly new. The practical problems with which it is confronted are in many ways strikingly different in different parts of the world—surpluses existing in many regions, severe deficiencies in others. The basic approach to the problems, however, has a common denominator—the transfer of know-how from the industrial countries to the pre-industrial ones, properly adapted to the new ecology, is vital and urgent. For nutrition, the 1970's must be a decade of extensive implementation.

Nutrition-implementation efforts are of special interest and importance, since they weave together activities which serve both the interests of a nation as a whole and those of its individual citizens. The aim is to create health and fitness for all and sundry and thus to contribute to a better quality of life and to equalization between different social groups. The wording of the UN Declaration of Human Rights—that everyone has the right to sufficient and proper food—must not remain an empty phrase.

At this very moment there are hundreds of millions of children in Africa, Asia and Latin America who are malnourished, many of them facing early death or serious sequelae as an inevitable prospect. Often malnutrition and severe infections go together and contribute to the enormous wastage of human life at an early stage. A recent study

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in Latin America has demonstrated that in this continent alone there is every year a loss of 780,000 children, who in North America or Europe would have survived to become healthy and useful members of society. For Africa and Asia the toll is greater, both in relative and absolute figures, corresponding to a loss of many millions of children every single year.

In this context it is worth remembering that countries with a socialistic political system, without exception, give high priority in their planning to child-health programmes, including nutrition.

These countries fully realize that (1) the improvement of the health of the children to-day will pay dividends in producing a healthier adult generation to-morrow, (2) few government actions will be as popular among large groups of the population as those aimed at improving child health, and (3), to those countries which have already recognized the threat of over-population, it is becoming increasingly clear that improved child care is of decisive importance in the stimulation of sound and efficient family-planning programmes.

This volume deals primarily with chronic, "silent" malnutrition. We all know that at certain times, due to disasters—whether caused by nature or by man—chronic malnutrition may extend into the realm of true famine on a large scale. It seems appropriate to refer at this time to the simple fact that everything which is done to improve nutrition in everyday life will at the same time help to delay the ill effects of an emergency situation and to hasten post-emergency rehabilitation.

The preparation of the seminar

The idea of making nutrition a topic for a Dag Hammarskjöld Seminar was brought up in 1969. In addition to representing a field of growing importance and a field where major progress could be achieved only by creating a state of awareness and a willingness to take action in a number of ministries, there was also the special situation that considerable experience in the field had been gained by Swedish institutions during the 1960's. Thus, since 1962 a Nutrition Institute had been built up step by step with Swedish governmental support in Addis Ababa. It was natural, therefore, to plan a seminar which made use of the facilities both in Sweden and in Ethiopia. For this seminar, a small

preparatory committee was formed, comprising Professor Bo Vahlquist (chairman), Docent Yngve Hofvander, Professor Karl Eric Knutsson, Professor Göran Ohlin and (from the Dag Hammarskjöld Foundation) Messrs Sven Hamrell and Olle Nordberg.

The main *objectives* of the seminar were the following:

(*a*) To create an awareness of the gravity of the problem of malnutrition also among representatives of ministries which are not normally in close contact with public-health problems but which are nevertheless of major importance in implementing programmes aimed at alleviating malnutrition.

(*b*) To make clear the role which each ministry will have to play in planning and implementing such programmes.

(*c*) To underline the importance of intimate co-operation in nutrition activities between a number of different ministries which otherwise may have limited contacts in their day-to-day routine work.

(*d*) To discuss the importance of nutrition in national planning and how to find ways and means of assigning to it the high priority it deserves.

Participants and programme

Nutrition means a lot more than the involvement of medical personnel in health programmes. At the grass-roots level, and even more in the policy-making bodies, there is a need for a broad approach, involving also many other professional people (agriculturists, home economists, community-development workers, teachers, communication experts, etc.) and, of course, the politicians. There is a need, therefore, to engage people with greatly differing backgrounds in the struggle against malnutrition.

For this particular seminar, some basic prerequisites were accordingly observed. Nine countries were represented, all belonging to English-speaking regions south of the Sahara, most of them by two or three members each. All the ministries of major importance for nutrition were represented (finance, planning, agriculture, health, education and community development), with a reasonably even distribution between them. The majority of the participants were senior officers, half of them on the vice-minister or principal-secretary level, and were thus ac-

customed to making decisions, often with far-reaching effects (cf. Appendix 1).

The fact that so many of the participants were high-ranking civil servants, along with the fact that the lecturers and quite a few of the observers were senior people with long experience of nutritional problems in developing countries was a guarantee that there would be a lively and stimulating discussion. The participants contributed very actively, both by presenting often very comprehensive country reports prepared in advance (cf. Appendix 2), by making stimulating interventions in the discussions and in person-to-person talks between the formal sessions.

This volume contains the introductory lectures *in extenso,* as well as the concluding "consensus of the seminar". No attempt was made to issue any specific recommendations. The reader will find that the presentation is not intended primarily for nutrition experts but rather for administrators, for politicians and for educated readers of any profession. It represents an attempt to engage their interest in a field which does not lend itself to simple and standardized solutions and which, partly because of this, has had to wait too long for strong and well-co-ordinated action.

The fact that nutrition is a complex subject should, in a sense, be a challenge rather than a repulsion to an imaginative mind. In recent years, specialists in a wide variety of fields have become "converts" to the idea of nutrition as a priority domain in national planning and development. Our impression was that some of the participants who came with little or no previous experience of nutrition problems and with no preconceived ideas had "seen the light" when the seminar came to an end.

In this context, it is interesting to compare the contributions by the two economists. Their backgrounds were very different and so were their approaches. But in an interesting way they complemented each other, pointing out, on the one hand, the ways and means of tackling constructively a complex problem with ramifications into practically all aspects of national functioning and human life and, on the other hand, the difficulties the proponent of nutrition is likely to meet when confronted with ministries which have meagre resources and multitudinous needs. A basic problem lies in the fact that the cost–benefit ratios of nutrition programmes are difficult to establish in a clear and convincing way and

further that, alongside the short-term goals, very long-term goals have also to be incorporated. This is not an easy task in societies in which the budgetary situation is liable to encourage "hand-to-mouth" approaches.

Perhaps the most important outcome of the seminar was to have brought those key people, the economists and the planners, into the middle of the picture. Once started, this process should go on. Only with the help of this type of professional person can implementation measures achieve sufficient coverage and depth at the same time.

The seminar took place in Uppsala and Addis Ababa. In Uppsala, the offices of the Dag Hammarskjöld Foundation, in a large house which once belonged to the 19th-century Swedish philosopher, E. G. Geijer, formed a pleasant and congenial place for the deliberations. At the same time the historical background of Uppsala was a reminder of the time when Sweden was still a developing country and when the great Uppsala paediatrician, Professor Rosén von Rosenstein, worked hard to reduce the appallingly high infant- and child-mortality rates which prevailed in Sweden two centuries ago.

In Addis Ababa, most valuable support was lent by the staff of the Ethiopian Nutrition Institute. In a final discussion under the chairmanship of H. E. Abeba Retta, the Minister of Agriculture, and with the participation of the Minister of Public Health, H. E. Ato Kettema, and the Head of the Planning Commission, Ato Belabai, the nutrition activities of the various Ethiopian ministries involved were presented.

Before closing the seminar, an evaluation discussion was held. Obviously, the mixture of participants from various ministries had had the intended effect of creating a lively and stimulating atmosphere and of making at least a beginning with the "across the border" contacts and the learning of a common vocabulary. In many quarters, the desire was expressed for a follow-up seminar of a similar kind in a few years' time.

What is urgently needed is a kind of blue-print for a large-scale strategy in the struggle against malnutrition. We hope that this Dag Hammarskjöld Seminar has helped in this respect and has created a degree of enthusiasm for the cause among the participants which will remain long after they have returned home. We also hope that some of this enthusiasm will illuminate the pages of this book.

Nutrition and Development in the 1970's

By ERNST MICHANEK*

Dr. Michanek discusses nutrition as a priority among other priorities which are also entitled to their due in development work. He emphasizes his conviction that nutrition and public health will play a predominant role in any national or international strategy for economic and social development in the 1970s.

I have been asked to place the matter of nutrition in its proper setting as part of the problem of development in the Second Development Decade. This is a tall order and certainly I am going to cover no more than a fraction of the subject and one or two aspects of it. Whatever I may say, it will in some way reflect the kind of problems I have to deal with myself in my daily activities as the representative of one of the "partners in development". Whether I speak on behalf of the Swedish International Development Authority (SIDA), which is a planning and executing agency for Sweden's participation in the international endeavours of development co-operation, or as the Swedish Government's representative on the Council of the UN Development Programme (UNDP) or in any other capacity as a participant in the international discussions, I feel that I have to try to find an answer to one question: what about nutrition—is it, should it be, will it be one of the high priority items in the field of development co-operation in the 1970's? This question is important not only for the experts—research workers, planners or administrators—who work on nutritional problems in the fields of health, food production or any other discipline. It is equally important for those who are organizing, staffing and financing the various efforts of international co-operation for development. This applies, of course, equally to the decision-makers, whether they are in a more developed country or in a less developed country, for they have

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to decide how much of the limited resources is to be allocated to one or another of a large number of competing claims and options. Is nutrition important and how important is it in comparison with *employment* in industry or agriculture or public service, with various aspects of *health*, including *family-planning*, with *education* and *training*, with *urbanization* and *environmental protection*, with various disciplines of *science* and *technology*, with the promotion of international *trade*, with national *defence* and *security*?

For some years I have been one of those who have urged the international community to draw up strategies and long-term plans for the development efforts of the national governments and the international organizations. I have personally felt an increasing uneasiness as one of the administrators of funds for development co-operation and I know that others have felt the same. Our funds and other resources, whatever their size and their rate of increase may be, are so terribly inadequate in relation to the vastness of the problems confronting us and to the requests for participation in development projects or programmes. There is a compelling need for internationally agreed goals and objectives and priorities, in order to put the scarce resources to use where the needs are the greatest and where the prospects of good use and relative efficiency are the best. If our endeavour is to be really international, such priority decisions cannot be made by one country alone, at least not by one country for another.

Over the first 20 years of international co-operation for development, the goals have changed as well as the methods; lessons have been learned. Development targets were expressed in overall figures of economic growth, such as the average, annual, national-growth rate of 5% put up by the UN for the development decade of the 1960's, or in other general terms, such as "primary education for all children", as put up by the UNESCO under its Addis Ababa plan for Africa, or the eradication of malaria, etc. Hopes were high: resolution-makers were happy; to at least some of them heaven was around the corner.

Today we all know better. Over-population in many countries in relation to resources, global air and water pollution, increasing unemployment and even increasing illiteracy, in spite of truly remarkable efforts by national governments, and a stagnant or even shrinking international endeavour to co-operate for development—these are the features of the international picture. Admittedly, there are other features as well:

enormous advances in science and technology, speedy food-production increases, and, not least, a growing *awareness* of the problems, their nature and complexity, of the scope for international co-operation, and of the need for it in *all* countries, irrespective of their degree of development.

It is a sign of healthy development that we, as specialists, planners and administrators of various institutions and government departments should get together to discuss the matter of nutrition as a priority in African development. We have done so because we are aware of some appalling facts which were not known before, for example, the figures which confirm that "malnutrition is the biggest contributor to child mortality in the developing countries". The United Nations in its international strategy for the Second Development Decade, as agreed upon by all member countries last fall, has explicitly included an improvement of the facilities for nutrition among the central goals and objectives for the development effort of the 1970's. It is felt that solutions to many nutritional problems are within reach, provided we collaborate to work them out and to make use of them jointly.

Indeed, there is nothing new under the sun, and many of my readers may say that the findings, declarations and resolutions of earlier years show that the importance of nutrition has been recognized and brought to the fore long since. In reply, I shall quote from one of Alan Berg's enlightening papers: "When looking at the development plans of most countries in the developing world, one seldom finds nutrition getting more than a passing mention". This, I am afraid, has also been true of most international declarations of great importance—until recently. Glancing through some of the key documents of the United Nations from earlier years gives the impression that the question of nutrition or rather of malnutrition has been little more than mentioned under the general headings referring to the provision of food, the improvement of health and social-welfare services or the raising of standards of living.

The new UN strategy goes much further. A few objectives of a social character are now quoted, together with the traditional economic goals, and they are referred to as "both determining factors and end-results of development"; it is said that economic and social objectives should be viewed as integrated parts of the same dynamic process and will require a unified approach. After employment and school enrolment and health programmes, the strategy refers to nutrition among the

central social objectives and states that "levels of nutrition should be improved in terms of the average calorie intake and the protein content, placing special emphasis on the needs of vulnerable groups of population".

In a following section under the heading of "Human development", the UN development strategy speaks of nutrition in the following way:

> Developing countries will adapt policies consistent with their agricultural and health programmes in an effort towards meeting their nutritional requirements. These will include development and production of high-protein foods and development and wider use of new forms of edible protein. Financial and technical assistance, including assistance for genetic research, will be extended to them by developed countries and international institutions.

This statement is in a document which has been adopted by *all* governments and in which they—and I quote from the preamble

> . . . pledge themselves, individually and collectively, to pursue policies designed to create a more just and rational world economic and social order, in which equality of opportunities should be as much a prerogative of nations as of individuals within a nation; they subscribe to the goals and objectives of the (Second United Nations Development) Decade and resolve to take the measures to translate them into reality.

I have included these quotations in order to bring them to the attention of planners, who should remember them, of people in finance ministries and development-co-operation agencies, who should give them full attention, and of the specialists and administrators in institutions and the various specialized ministries, who should use them when pressing for funds and other resources to be allotted to nutritional activities. For an agency like the SIDA, the high priority thus given to nutrition by the United Nations is encouraging indeed, and for the Swedish Government representatives in various international organisations, such as the FAO, the World Food Program, the UNICEF, the WHO, the UNDP and the World Bank, such statements are valuable arguments when priority areas of development co-operation are being discussed.

Now, general declarations are general, and the practical field work requires more elaborate guidelines. It is highly appreciated that lately the specialized agencies and organs of the United Nations have begun to work out a series of sectoral strategies, which may serve both national

authorities and international organizations and institutions in drawing up their detailed plans for the development effort.

First, the FAO drew up its Indicative World Plan for Agricultural Development, and in its publication last year of a summary of that Plan under the title of "A Strategy for Plenty", the FAO, after considering the question of increasing the *quantity* of food produced, brought the question of *quality* into the picture. "Tap all resources for protein" was the heading for this part of the agricultural strategy for the next decade.

Other specialized agencies are now at work on their sectoral strategies. The ILO is working on a World Employment Programme, on which the latest debate was held at the International Labour Conference in Geneva last month. At the request of last year's general conference, the UNESCO is now working on a new international strategy for education, and the other agencies of the UN system are following the pattern. To what extent the matter of nutrition will be given attention in these documents-in-being is too early to predict, but it would seem appropriate to bring the matter to their attention. Two recent UN documents may be helpful in this respect.

One is the Strategy Statement on Action to Avert the Protein Crisis in the developing countries, which the Secretary-General recently placed before the Economic and Social Council of the UN and the General Assembly. The Secretary-General has found the statement convincing and recommends it to the consideration of governments.

Another specialized strategy statement, which is now also before the international fora, was produced a few months ago by the UN Advisory Committee on the Application of Science and Technology to Development (ACAST). This world plan of action in the field of science, like the strategy statement on the protein crisis, was prepared by a group of experts from countries at different stages of economic development, and contained a large number of practical recommendations regarding the build-up, not least in the developing countries, of a scientific potential.

These very condensed documents contain a wealth of facts and arguments in their respective fields. To specialists, the conclusions may sometimes appear vague, but I, for one, must say that they have been very enlightening and convincing. For one who seeks guidance in decision-making on priority sectors and subsectors in development co-

operation and who must be prepared to justify his choices among a host of competing demands, it is priceless to have these catalogues of arguments in support of the more general statements of the UN Development Decade Strategy. A similar treasury of facts and proposals was first produced two years ago by the Pearson Commission in its report entitled "Partners in Development", which was worked out and published at the request of the President of the World Bank. The collection of papers on development strategy, which has been produced since then or is now in the process of being produced, will form a very valuable basis for the decision-makers at both the national and international levels.

What I have found particularly valuable in reading the papers on protein and on science is their cross-sectoral character, the compelling need for action in the field under review, in order to solve adequately any of the other sectoral problems. To attack the problem of illiteracy and ignorance without at the same time attacking the main nutritional deficiencies which inhibit learning capacity seems futile, to say the least. To build up a body of general health services without beginning at the beginning, i.e. at the build-up of the human body, is simply uneconomical. To increase food production without taking care of the real intrinsic value of the foodstuffs already produced or the potential for increased quality within the framework of the existing quantities is just wasteful. To put funds into job-creating activities without at the same time building up the potential productivity increase of the working population by means of an improved food standard is counter-productive. I feel convinced, by the experience given, that gains in the fields just mentioned will in fact be more cheaply achieved by measures in the field of nutrition than through any quantitative expansion of the traditional public services or activities for health, education, employment or food production (which is, of course, not an argument for not expanding these services).

Yet, to speak in terms of economy seems both superficial and cynical in this context. Should not the provision of food of a nutritionally high standard in sufficient amount constitute a *basic human right* of the individual and consequently a basic obligation of the modern society? Is it not, these days, in fact anachronistic to legislate on universal free education, general health insurance and hospital services, full employment and the like, without first creating the human basis for all this,

an adequate supply of food for the people? I think that in fact the introduction of some of the social measures of modern states in very poor countries means that they have uncritically imported ideas from economically more advanced countries, where such measures are based on the assumption that the basic problem of food has in principle already been solved. This may be to over-simplify the case, but it seems to me that, now that we know both the problem and in fact also its principal solutions, it is completely intolerable that modern society should not give the production and distribution of foods the absolutely first priority. I feel convinced that the undernourished or malnourished masses of the urban conglomerations of today and tomorrow will become strong enough and get enough support for their basic demands for food to be given its proper place in the political context. It is for politicians and planners to anticipate this situation and to solve the problem before it has taken on disproportionate dimensions. (May I just insert, that in China, during a visit recently, I neither observed nor heard of any starvation similar to what one can very easily observe in a large number of other countries. I still feel, though, that democratic societies are capable of at least as good an economic and social performance as any other system of government.)

Lastly, to me the most convincing of all the arguments of the specialists in nutrition is the one in favour of a better food supply as one means of solving the problem of over-population. Again, the most appalling fact of all in the contemporary world situation is that the *great majority* of deaths in poor countries are among children under five. For example, 80% of all deaths in Pakistan and Brazil are in this group of small children, a group which makes up less than 20% of the total population. In Sweden this age-group accounts for only 2% of the deaths, although it makes up 7% of the population. In the group aged 1 to 2 years the death rate is *72* times higher in rural Punjab than it is in Sweden, and Punjab is one of India's strongest and healthiest areas (as Alan Berg and Robert Muscat have observed in their paper on the planner's view of nutrition and development). The reason for this state of affairs—both in the death-stricken areas and in Sweden—is the nutritional situation. The main killer is malnutrition. Today, it is not that the food required cannot be produced in or transported to the areas where these mass deaths occur; in fact, at least to a large extent, it is already there. The problem is principally one of organiza-

tion, of the distribution of food and knowledge. Millions and millions of these deaths are unnecessary, and in the world of today there are no insurmountable difficulties in avoiding most of them. The cost is relatively modest; the benefit would be enormous. I think that the mothers and the fathers of the dead babies know or at least feel that this is so. I am in no doubt that the most valid argument *against* family-planning in such circumstances is the fact that children die. If you don't believe that your child will survive, you produce another or several more. The best argument in favour of family-planning is that the children survive. The key word is food; food is the road to survival and health.

The international community dealing with population and family-planning is convinced today that one of the principal solutions of the problem of over-production of babies is better mother-and-child health care at the time of pregnancy and childbirth and immediately after. The build-up of a system of mother-and-child stations is more and more being seen as the main road to success in the endeavour to limit births. At these stations, nutritional, hygienic and contraceptive education will form the most important part of the treatment. The key drug is food.

There are not two subjects of greater importance in international research and development activities in the present world situation than those connected with baby-feeding, in a wide sense, and with contraceptive technology.

In Sweden we have shared in the initiatives that have been taken and that have now been promoted under the leadership of the World Health Organization to increase immediately and very substantially the international endeavours to widen and deepen the research activities connected with human reproduction in all its aspects. Sweden has recently been happy to join the new international consultative group for the advancement and financial support of agricultural research, especially oriented towards the wider application of the findings which have led to what is called the "green revolution". In the planning for future activities we are now eager to share with the governments of the developing countries the knowledge and inspiration which may lead to new departures in the field of research and development on nutrition, which constitutes the link between food and health. We are prepared to support and participate in new undertakings in this field.

Among the sectoral or rather cross-sectoral international strategies,

one is missing and is badly needed: a strategy for population. The UN document which I have referred to is deplorably soft, not to say silent, on this crucial matter in world development in the 1970's. I am not going to dwell here on this point, on which, however, we are very active in various international fora; I would only emphasize my conviction that, in any national or international strategy for population, food, health and nutrition will play a very predominant role. The limitation of births, which must be a goal, begins with a limitation of deaths. So it has been, so it will continue to be.

In Swedish social policy, a principal political objective is that all children born should be children who are welcome. This requires that the parents shall feel sure that they can support the children who are born—assisted by public services for mother and child, as necessary—that people have the knowledge of how to avoid conception, and that the means of contraception are available. Sweden has a lower death rate among children than any other country; it has one of the lowest birth rates in the world. Good nutritional conditions are an important part of the reason for this state of affairs.

Nutrition offers one of the principal answers to the most serious problems concerning both *death* and *life* in the 1970's.

Part I

Problems of Human Malnutrition

This section is intended to supply a background to the following discussion. The authors give, each from his professional point of view, a survey of the individual and social implications of malnutrition.

The clinical aspects of malnutrition are displayed and the reader is also introduced to the wide spectrum of interrelated problems in social and preventive medicine. The interplay between nutrition and ecology *in toto* is underlined, and the effect of change in the traditional subsistence society is discussed. The community nutrition level is related to the variety of socio-economic factors which are its determinants.

Malnutrition as a Socio-medical Problem

By BO VAHLQUIST

With respect to both the prevalence of disease and the death rate, malnutrition (as sole or contributory cause) ranks very high in the developing countries of the world. The effects of malnutrition *per se* are aggravated by the simultaneous occurrence of multiple infections. This is true especially of the children who are prematurely weaned from the breast. The ill effects of malnutrition are not restricted to the acute episode alone. Late sequelae of protein–calorie malnutrition (PCM) affecting physical development seem to be of common occurrence. Among the survivors of severe PCM, impairment of mental function has also been observed.

Nutrition has as its objective to direct attention to the food needs of individual human beings or groups of human beings. Interest in nutrition has emerged from the growing awareness that food production alone, even though abundant, does not in itself guarantee that all the major sectors of the population will get the share of calories and nutrients which they need in order to safeguard their health and their fitness. This may be illustrated by a schematic diagram (Fig. 1).

During the post-war period, nutrition has been given ever-increasing attention. But even today, to quote a recent speech by Dr Boerma,[2] the Director-General of the FAO, "nutrition has not yet attained its full and proper place in the scale of priorities that guide the thinking of those who devise the policies that govern our lives". Why is this so? Why is it that "continued malnutrition mocks the basic aim of development and hinders its effective realization"? Why is it that nutrition is not recognized, as it should be, as one of the key factors in development?

Dr Boerma gives three main reasons why we should take another look at the relationship between economic growth, nutrition and development itself. First, because nutrition is more closely linked to economic growth than is sometimes realized: "Malnutrition can wreak havoc with a country's growth potential." Secondly, because economic growth is

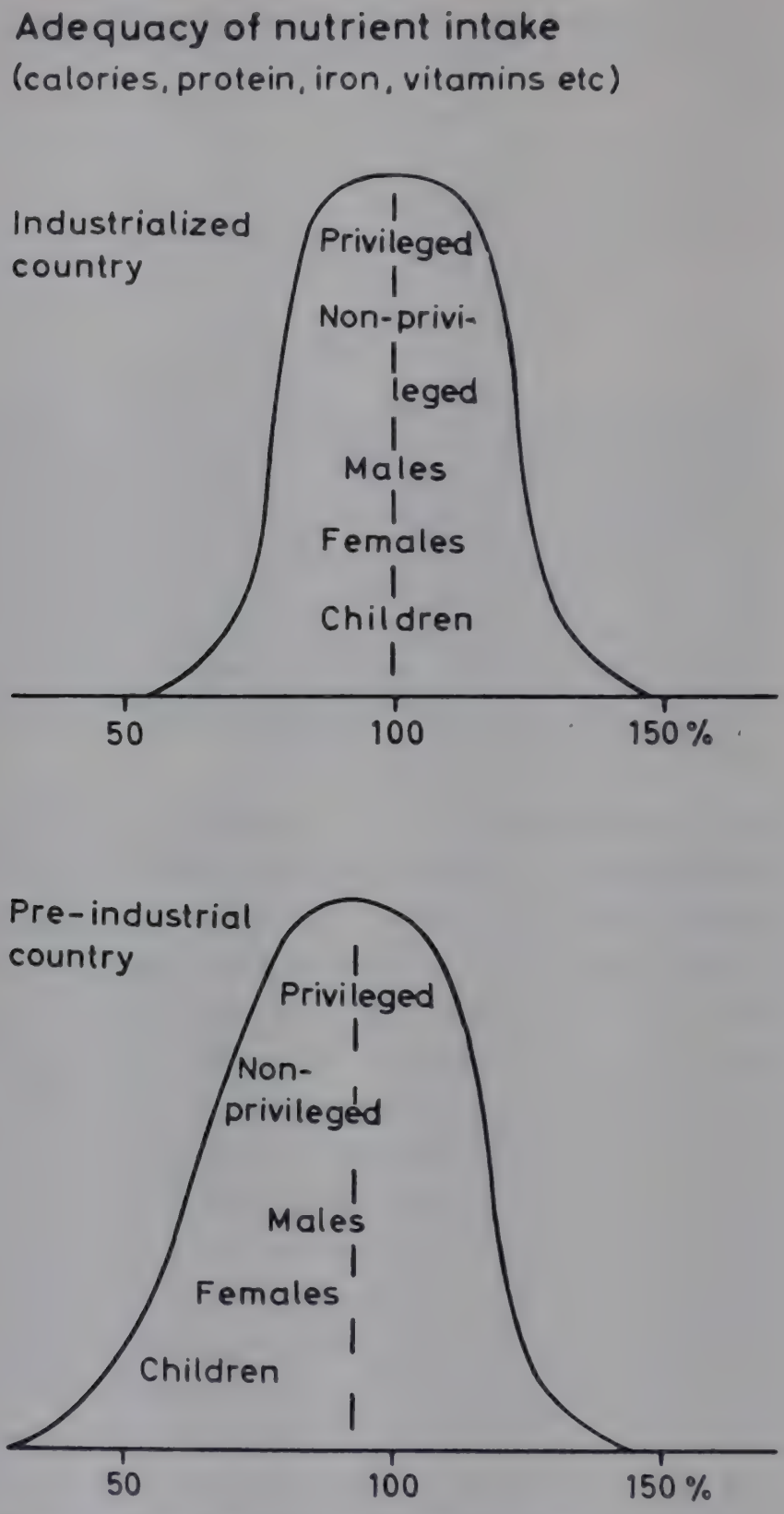

Fig. 1. In a pre-industrial country, the children and females of non-privileged groups often have a grossly inadequate intake of nutrients.

not a simple, ready-made solution to the problem of malnutrition. Thirdly, because economic growth has come to play too large a part in our thinking about development.

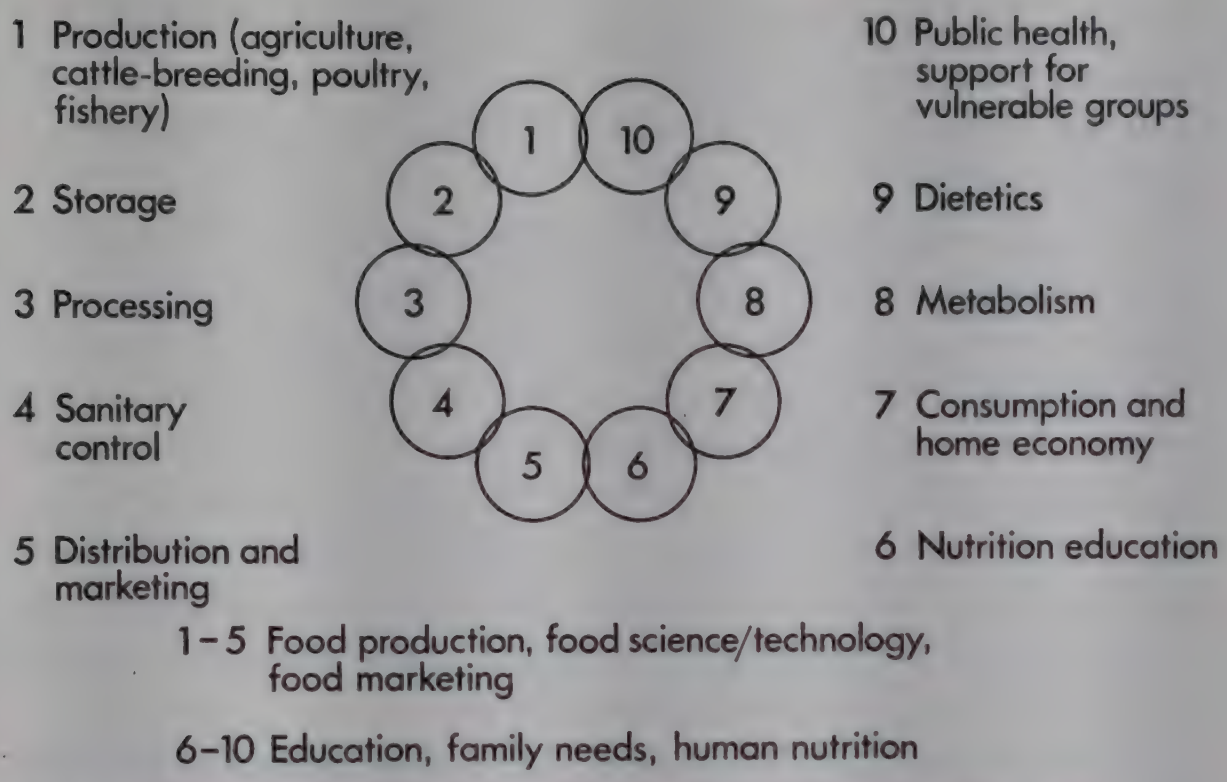

Fig. 2. Integration between different types of activities related to nutrition.

One of the reasons why nutrition, both in science and in governmental programmes, has for long met with many obstacles to the realization of its aims is that nutrition is in an almost unique way interdisciplinary in character. In science it needs the co-operation of a number of different disciplines and in governmental programmes it needs the co-operation of a number of different ministries. It is true that the analysis of prevailing nutritional deficiencies among various population groups should primarily be the concern of the ministries of health, which may thereby also indicate in which direction special intervention is most urgently needed. At the same time it is just as true that the resources for alleviating malnutrition can be mobilized on a large scale only by the strong intervention of other bodies, in which the ministries of agriculture often play a dominating role but in which many other ministries are included, such as those of commerce, education, community development, planning and, indeed, finance. Fig. 2 illustrates the integration between a number of different types of activities which are important for achieving a good level of nutrition in human beings.

The vulnerable groups

For a long time it was thought that malnutrition was ubiquitous among the underprivileged groups in the developing countries. Today our view

is much more diversified and succinct. We know that the pattern of nutritional diseases varies a lot from one country to another; we also know that there are great age and sex differences in susceptibility to nutritional disease.

The term *vulnerable groups* includes, first of all, those large sectors of the population which are made up of children and of women in the reproductive ages. They are vulnerable primarily because of their relatively great nutritional needs, and in the case of the young child also because of their complete dependence on the support of others. When this inherent vulnerability is combined with socio-economic stress factors, such as poverty, ignorance and primitive living conditions, the situation of these groups may become truly precarious. In publications by public-health physicians and nutritionists, more and more attention has in recent years been given to these groups.

Children between 0 and 15 years of age in most developing countries form 40–50% of the total population, as compared with only 20–25% in the most technically developed countries. In developing countries undernutrition and malnutrition among *young children* are essential contributory causes of the often alarmingly high death rates, commonly amounting to 25–30% before the age of 3 years and up to 40% before the age of 15 years. I shall come back later on to the long-term sequelae in the survivors.

It should be remembered that official statistics, in so far as they are available, always grossly underrate the prevalence of malnutrition. In a study of pre-school children in Guatemala, malnutrition was given as a cause of death in 1%, whereas a special study showed that the true figure for malnutrition as the only *or* as a contributory cause of death was in fact 40%. This underlines the importance of having access to data from special nutrition surveys in the field, in order to make a correct appraisal of the importance of malnutrition as a public-health problem, and also as a national problem, in different regions of a country.

Pregnancy always means a considerable nutritional drain on the mother. If her nutritional status is poor—maybe affected by repeated earlier pregnancies at short intervals—this means that the situation is precarious both for her and for the child yet unborn. A growing number of observations indicate that the most sensitive period for the individual, also from the nutritional point of view, may be in foetal life.

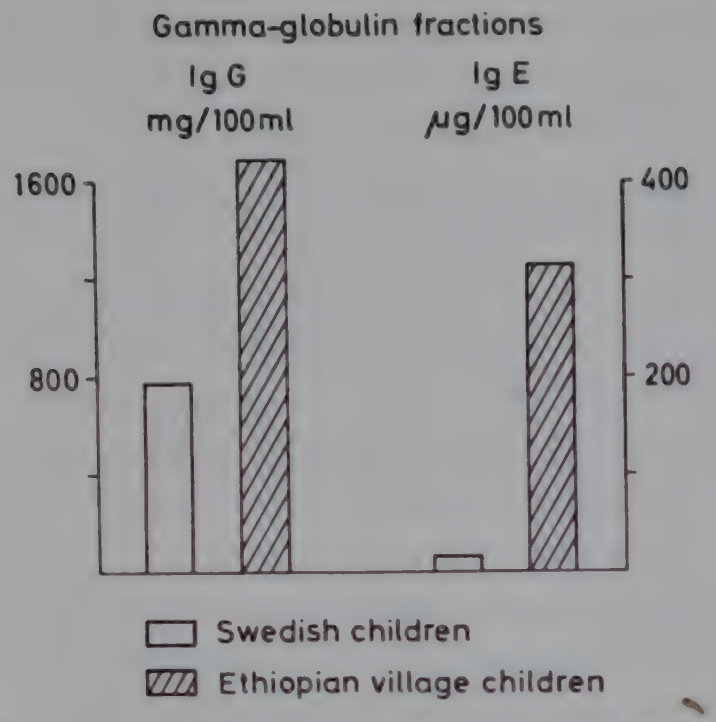

Fig. 3. Effect of accumulated infections and parasitosis. High levels of gamma-globulin G and E in the blood of Ethiopian village children (5).

Malnutrition and infections—a vicious circle

One of the striking things which a paediatrician who is a newcomer to a developing country realizes is that, even in children who are not overtly ill but run around and play, there are signs of an overwhelming number of infections, either ongoing or past. They include the whole pattern of temperature-zone "children's diseases", like whooping cough and measles, the gamut of upper respiratory infections and diarrhoeas and area-specific tropical diseases, like malaria and many types of parasitoses. By examination of the blood, it is possible to reveal also past episodes of disease; for example, in many areas not yet covered by immunization schemes it is typical for the vast majority to have had a polio infection before the age of 3–5, so far luckily mostly without manifest paralysis, thus repeating the situation in Sweden a century ago.

The body reacts to infection both in non-specific ways (fever, increased blood-sedimentation rate) and in a specific way, with clinical signs of the disease (measles, whooping cough, malaria, or whatever it may be) and with the appearance in the blood of specific circulating antibodies localized in the gammaglobulin fractions. We have carried out some pertinent studies in Ethiopian village children. In apparently healthy

youngsters we found blood-sedimentation rates of the order of 30–50 mm/hr, as compared with the usual rate of below 10 mm/hr in age-comparable groups of Swedish children. With respect to the immunoglobulin fractions of the blood, the differences were again striking.[5] This last observation is illustrated in Fig. 3.

One may always speculate as to whether such differences may have, at least partially, a genetic background. Time does not permit me to go into details. Let me just say that there is every reason to think that the differences are purely environmental in origin and are an indication of the very serious shortcomings of the milieu in which the children have to spend their lives.

Malnutrition is usually also widespread among children in the same areas in which infections are rampant. Is there an interaction between the two and, if so, what are the consequences? To be brief, there is good evidence that infections may greatly influence the nutritional status of children. They may do so in various ways: the appetite is decreased, the metabolic breakdown of tissues is increased, diarrhoeas may interfere with the absorption and utilization of food, diet prescriptions may act in a harmful way, etc. If infections are long-lasting or recur all the time, the unfavourable effect on the nutritional status may also be long-lasting.

Can malnutrition predispose the child to contract infections and/or influence their course and outcome? There is now ample evidence that at least the latter possibility exists. The reaction to measles is often given as a typical example. In a country like Sweden, this disease carries today a mortality risk of less than 0.01 %. In several African countries, an average mortality risk of 5 % or more has been observed, in hospital cases up to 25 %.[7] There may be several factors that contribute to this enormous difference, but it is quite clear that the crucial one is the poor nutritional status of the children affected. It is also typical for outbreaks of measles in developing countries to be regularly followed by an accumulation of cases of marasmus and/or kwashiorkor.

It is quite clear, then, that there is a vicious circle connecting malnutrition and infections, especially in children. It follows as a corollary that intervention procedures against certain types of infectious diseases, for example, BCG vaccination, triple vaccination (= vaccination against diphtheria, tetanus and whooping cough), measles and smallpox vaccinations, etc., may act as a useful weapon also in the fight against malnutri-

tion and should be recommended for wide use wherever possible and at an early age.

The long-term sequelae of severe malnutrition in early childhood

Contrary to earlier expectations, an abundant food supply does not always completely overcome the ill effects of severe malnutrition. Scientists demonstrated long ago that the weights of animals which had been reared under conditions of severe protein and/or calorie restriction at an early age did not catch up with those of their age mates, even if food was plentiful during the rest of their lives.

The first publication that clearly demonstrated that the same is true also of human beings was that of Greulich in the 1950's.[3] He showed that Japanese children who had been born and reared in California grew much faster and reached a considerably greater adult height and weight than their age mates from the same area in Japan who had remained in their home country. The obvious explanation was that, in Japan at that time, environmental factors restrained the full development of the genetic potentialities that influence adult stature.

The observations just referred to were later amply confirmed by observations in many other parts of the world. Members of our own team have provided data of this kind relating to groups as different as the children of nomad Lapps in northern Sweden[6] and of Ethiopian village children.[4] Both point in the same direction: the early influence of a grossly unfavourable environment has a lasting effect on the individual. Thus, many of what used to be called "racial differences" in height, weight, etc. are not genetically determined and are thus more liable to be influenced and levelled out in the foreseeable future. As a matter of fact, the "secular trend" in growth and development in western countries, a trend which, as regards Sweden, has meant that the average height of adult citizens is today 10 cm greater than it used to be a century ago, to the best of our knowledge is mainly to be explained by improved nutrition during the first few years of life.

What is the mechanism behind the fact that severe undernutrition in early life can produce such permanent sequelae, whereas severe undernutrition later on in life never has such consequences? To answer this question, we must go to another field of recent scientific advance. Thanks to the observations made primarily by American research

workers,[8] we know that the growth of a subject means different things at different times. In the foetus and the young child it is mainly a question of an increase in the *number* of cells; later on it becomes more and more a question of an increase in the *size* of individual cells. The increase in the number of cells ("cell multiplication") in different organs stops at different times, and for human beings cell multiplication has, on the whole, come to an end at the age of 2–3 years. If, for some reason, for example, severe malnutrition, cell multiplication has been retarded and the number of cells is still markedly below normal at a time when multiplication ceases completely, then such an individual will remain subnormal with respect to the numbers of cells for the rest of his life, and nothing done later on in life—either optimal nutrition or anything else—can change this situation; it is irreversible.

I have so far discussed adult stature as influenced by malnutrition in early life. What really matters, however, is not size so much as *function.* Function can be measured in many ways: as resistance to disease, as capacity to perform physical and intellectual work, as the retention of good health in old age. I shall comment briefly on two of the types of function I have just mentioned.

Physical work. In the mid-1960's members of our group performed a study on physical-work capacity in Ethiopia, in schoolchildren and in adults, making use of modern ergometric technique.[1] Fig. 4 illustrates the working capacities of three different groups of adults. Obviously two factors related to nutrition may explain the inferior work capacity of the shoe-factory workers; one is the suboptimal stature due to malnutrition in early life and the other is the persistently poor diet, with its unsatisfactory protein quality.

Intellectual work. More than other recent discoveries, the observation that malnutrition may influence the development of the brain and possibly also impair intellectual capacity has attracted the attention of scientists and political leaders alike, and has contributed to an appreciation of the fact that malnutrition in early life has far-reaching and possibly devastating socio-economic consequences.

Scientists working with animals observed long ago that also the brain may suffer from severe malnutrition, for example, the brains of growing pigs. However, at that time much more emphasis was given to the fact

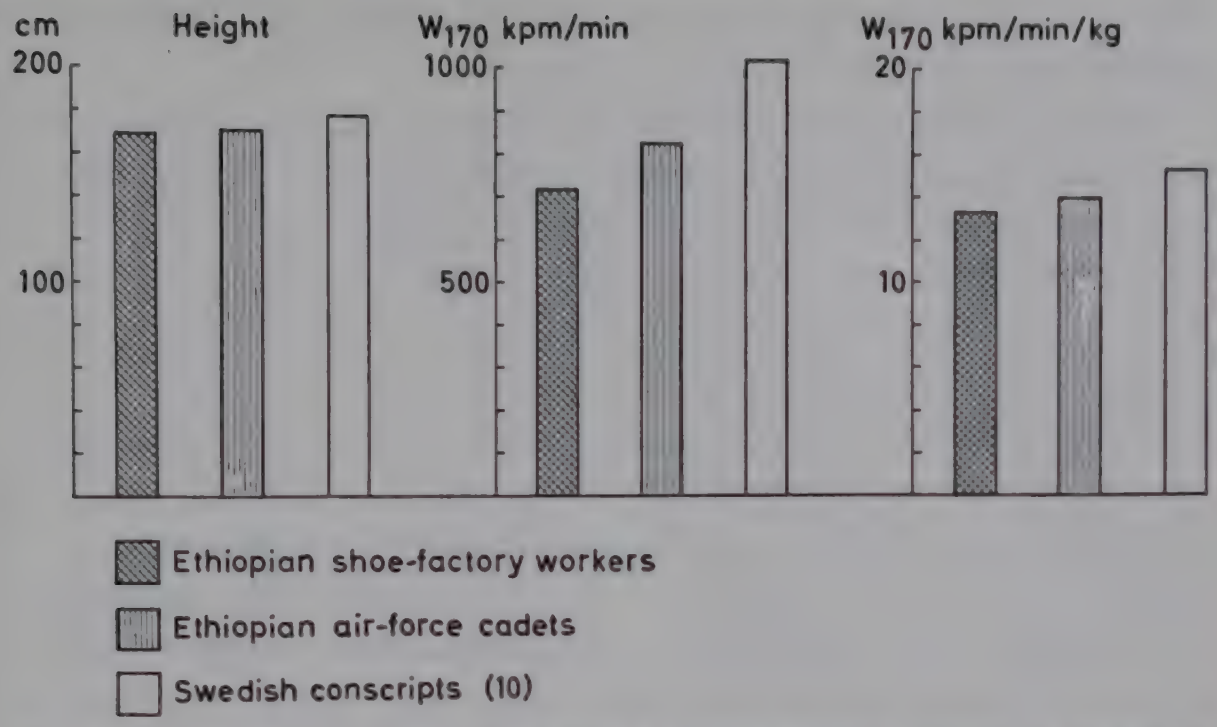

Fig. 4. Working capacities (mean values) in three different groups of adults, as tested by bicycle ergometry (1).

that the effect of malnutrition, as measured by gross weight, was *relatively* much less on the brain than on the body as a whole.

The human brain grows very fast during foetal life and during the first few years of life. In a 3-year-old child, the brain weight has already reached 80% of its final value, the body weight only 20%. It is not only the weight of the brain which changes so rapidly in early life; there is also at the same time a rapid maturation of the microstructure and the chemical composition. The nerve cells proper have reached their final numbers even before birth, but the glia cells continue multiplication up to the age of 6 months. Also after this age and up to the age of 2, important chemical maturation processes go on, for example, with respect to myelinization of the fine tubes surrounding the nerve fibres. With this partly very recent knowledge, the scientists are no longer surprised that severe malnutrition in early life, before birth as well as after, may have far-reaching effects on the brain and its functions.

It is, however, important to make a clear distinction between what is definitely known at this time and what are more or less valid assumptions that are still under test. We know for certain that severe malnutrition during early life also in human beings causes a reduction not only of brain size but also of the total number of brain cells. It is possible

that the effect of malnutrition also in this respect is enhanced by simultaneous infections.

There is circumstantial evidence that not only the structure but also the functional capacity of the brain—including what we somewhat glibly call intelligence—will suffer indefinitely, because of the same unfavourable influences from the surroundings at an early age. However, in discussing intelligence, the analysis of causes and effects becomes much more complex. In the families in which nutrition is poor, infections are common and one finds, almost as a rule, other disadvantages, like deprivation and under-stimulation. Only through studies of well-defined population groups over a number of years will it be possible to get a final answer to the question of what malnutrition *per se* means. Well-planned and documented studies are now going on in 8–10 places, ranging from Central America in the west to India in the east. We hope that it will be possible to arrange a conference for the co-ordination of these studies with respect to technique and the interpretation of the results in Sweden in 1973. Until then—perhaps even longer—we shall have to postpone the drawing of any definite conclusions.

The prevention of malnutrition in early childhood

I shall dwell only on two topics which are rarely dealt with more than very superficially at meetings of this character and which still deserve attention far beyond medical circles. I refer to the nutrition of the pregnant mother and to the breast feeding of the infant and young child, in other words, to the nutritional situation of the *mother-and-child unit*.

Nutrition of the pregnant mother. It goes without saying that, for the mother, pregnancy means a drain on her supply of nutrients which is quite considerable. It has been estimated that the pregnancy and lactation periods, taken together, mean an extra demand, if optimal development is to be ensured, of some 219,200 calories, i.e. 110 extra days of full consumption for an adult, and some 6400 grams of protein—not to mention minerals, vitamins, etc. This is for a single pregnancy and lactation. It is easy to understand how precarious the situation can become if pregnancies are repeated over and over again,

maybe ending up with six to ten or more over a period of 15 to 20 years. Even with a reasonably good diet, it may be difficult to keep the mother in a satisfactory state of health. If the mother was already a bit undernourished before she reached child-bearing age, if her diet was always improper and if multiple pregnancies followed at an interval of only a year or two, then the nutritional consequences may become serious indeed and may contribute to the illness and early death of the mother herself.

And then, what happens to the child which such a mother carries in her body? It has been customary to say that nature gives such priority to the successful outcome of a pregnancy, in order to safeguard the maintenance of human life, that even in an undernourished mother the foetus will be able to get what it needs. However, this concept obviously has its limitations. We know today that innumerable children in developing countries start their extra-maternal life under weight because of malnutrition even during foetal life. The difference in birth weight between the children of underprivileged families and those of privileged families may amount to 10–15% or more. Furthermore, the children of underprivileged families may lack many of those depots of nutrients which should normally be accumulated during foetal life and may thus be candidates for the early development of protein–calorie malnutrition, and of mineral and vitamin deficiencies, such as iron-deficiency anaemia, vitamin A or B deficiencies, etc.

From what I have just said, it is clear that concerted efforts should be made to improve the health, including the nutritional status, of pregnant and lactating women.

The paramount importance of breast feeding. Before birth, all nutrients and oxygen are carried via the blood stream to the foetus. Delivery means an abrupt change in this situation. The intimate biological link is suddenly severed and the lungs, the gastro-intestinal tract and other organs of the child have got to start functioning or to take up new functions. To safeguard the transition during a long, delicate period of life, nature has provided a special and unique system, comprising the mammary glands and their secretion, the breast milk. Both with respect to nutritive value, physical characteristics and cleanliness, breast milk is ideally fitted to the needs of the young child.

A conservative appraisal shows that 80–85% or more of all women

have the capacity to breast feed their babies for up to 6 months or longer. Why then is it that in many western countries today breast feeding is practised only for short periods or sometimes not at all? The answer is a complex one. There are always some women who fail in this respect for biological reasons, that is, even with the best intentions they do not manage to provide milk in quantities large enough for their baby. For the offspring of these mothers, substitutes had to be found, making use of cow's milk or other animal milk. It turned out that, if these substitutes were carefully prepared in a knowledgeable way, taking all hygienic precautions, the baby could not only survive but even thrive on such artificial feeding. Later, modern technology went a step further, producing nutritious and convenient formulas on an industrial basis. Mothers who had to work outside their homes eagerly accepted them; so, unfortunately, did large groups of other mothers who had no pressing need to do so but just followed the trend.

Now, if mothers in the industrialized countries can rear their babies with reasonable success, using only short periods of breast feeding or even none at all, why should not this be possible also for mothers in the pre-industrial countries? The answer is that it is indeed possible for mothers who are well educated, are in a good financial position and have regular access to well-baby clinics. But how large is the category of such mothers in, say, an African country? They are in a very definite minority in the cities and they are exceedingly few in the predominant rural populations.

For the overwhelming majority of families in pre-industrial countries, it is true to say, not only today but also for decades to come, that breast feeding means literally life or death for the baby during the first 6 months of life and is of enormous importance also for a long period thereafter. For these families there is simply no alternative which combines the virtues of being hygienic enough and nutritious enough and yet within financial reach. Thus we are faced with a situation in which we know, on the one hand, that the first few years of life, and especially the first 6 months of life, are more precarious than any other period, with the looming risk of permanent sequelae to body and brain, and, on the other, that for decades to come in many regions of the world no valid alternative to breast feeding will be available. This points to the extreme importance of counteracting by all possible means

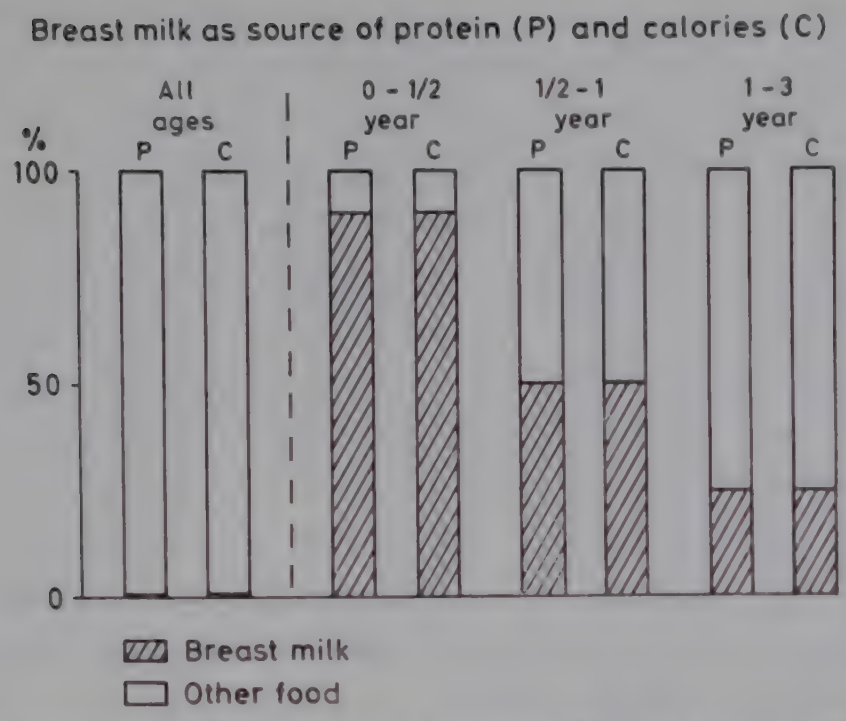

Fig. 5. The paramount importance of breast milk as a source of high-quality protein and calories for infants and young children in pre-industrial countries.

the tendency to shorten breast-feeding periods, which has been observed also in some of the developing countries.

A final comment in this connection. The importance of the amount of protein of the highest biological value—and also of other valuable nutrients—which are produced in the breast milk should not be minimized. For a single child the amount of breast milk produced may well be of the order of 150–200 litres. On a national basis the amount of breast milk consumed may in certain areas easily match or even surpass the amount of cow's milk consumed. But again the special importance of breast milk lies in its being the ideal complete food—later on a food supplement—during the *first crucial period of life*. The diagram in Fig. 5 will emphasize this fact.

Malnutrition in other groups than the vulnerable ones

The presentation so far has dealt mainly with malnutrition in young children and in pregnant women. There is good reason for this, since the effects of malnutrition, be they acute diseases, maybe with fatal outcomes, or permanent sequelae in the survivors, make the problem of malnutrition in the foetus and the young child uniquely important also on a national level.

But what about the situation of the schoolchildren and the adult

males? Again, much more attention should be given also to the nutritional problems of these categories. The reduction of working capacity through malnutrition alone warrants such a statement. It is hardly a sensible policy to build schools and train teachers without considering the health of the children to be taught. Even without manifest starvation, prolonged intervals between food intakes, with ensuing low blood-sugar levels, may well hamper the learning capacity of the pupils. Everyone of us knows how difficult it is to concentrate on a given task if the last food was consumed many hours ago and hunger is gnawing. Too many schoolchildren in the world start their day with a light meal early in the morning and then get nothing until the end of the day, after many hours in school and, maybe, many hours of walking as well. School lunches and school gardening programmes deserve the greatest attention from the political leaders.

As long as they are "breadwinners", the adult males certainly also deserve to have their nutritional needs well covered, in order to preserve their health and guarantee full working capacity. This is not only in the interests of the family but of society as a whole. Fortunately, in the adult, and in the male especially, food is not necessary for growth any longer but only for maintenance and for energy production. This means a *relatively* lower demand (per kilogram of body weight) for calories and nutrients and at the same time also a smaller claim on *protein quality* than in pre-adult age. From this point of view, it is a source of worry that in many cultures the adult males traditionally look upon it as their prerogative to be first at the table and to select the most tasty and at the same time often the most nutritious parts of the dishes offered. There are good arguments, as we have heard, that it should rather be the other way round, i.e. that the women and children should be given priority.

References

1. Areskog, N. H., Selinus, R., and Vahlquist, B.: Physical Work Capacity Related to Nutritional Status—a Study using the Bicycle Ergometer and the Dynamometer in Ethiopian Male Children and Young Adults. *Am. J. clin. Nutr.* 1969: 22, 471.
2. Boerma, A. H.: Keynote Address to the First Asian Congress of Nutrition, Hyderabad, 1971. *FAO Nutrition Newsletter* 1971: 9, 1.
3. Greulich, W. W.: Growth of Children of the Same Race under Different Environmental Conditions. *Science* 1958: 127, 515.

4. Hofvander, Y., and Eksmyr, R.: Anthropometry of Children in a Typical Rural District and an Urban Slum Area in Ethiopia. *Courrier* 1971: 21, 1.
5. Johansson, S. G. O., Mellbin, T., and Vahlquist, B.: Immunoglobulin Levels in Ethiopian Preschool Children with Special Reference to High Concentrations of Immunoglobulin E (IgND). *Lancet,* 1968: I, 1118.
6. Mellbin, T.: *The Children of Swedish Nomad Lapps. A Study of their Health, Growth and Development.* Acta Paed., 1962: 51, Suppl. 131.
7. Morley, D., Woodland, M., and Martin, W. J.: Measles in Nigerian Children. *J. Hyg.* 1961: 61, 115.
8. Winick, M.: The Effect of Nutrition on Cellular Growth. *Symposia of the Swedish Nutrition Foundation,* 1969: VII, 30.

Malnutrition and the Individual

By YNGVE HOFVANDER*

Malnutrition is most liable to afflict the young, fast-growing child. Both under "normal" conditions and in emergency (famine) situations the heaviest tolls of disease and death are always found in that age group. For school-children and adults, malnutrition may interfere seriously with learning capacity and fitness for work. In this chapter, the disease patterns of the more prevalent nutritional diseases are presented, with special emphasis on protein–calorie malnutrition (PCM).

In times of disaster and famine, as in Pakistan recently, attention is focused on the human suffering and in particular on the suffering of the children. The mass media have described the acute effects of starvation and it has become apparent that one important reason for these effects is that a sizeable part of the population in these countries and in particular the child population is suffering from chronic malnutrition or the after-effects of malnutrition even under "normal" conditions.[1]

Due to the fact that children are growing, and pregnant and lactating mothers have to produce and furnish other individuals with food, their need of calories and nutrients is relatively greater than otherwise (Table 1). For young infants, the need of calories per kilogram of body weight is of the order of 100 or more. It is even greater for premature infants and for infants who are recovering from malnutrition (up to 200 cal/kg). Later in life, it gradually decreases to a level of about 40 cal/kg in adults.

The requirement of protein is very high per kilogram in small children (2.2 g/kg during the first 2 months) and then decreases to less than 1 g/kg in adults. Other nutrients are required in much the same way.

What is malnutrition?

In principle, a long-standing under-consumption of calories or any of the individual nutrients will cause a specific type of malnutrition (Table

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Table 1. Recommended dietary allowances (Food and Nutrition Board, USA 1968).

These figures are "generous" and often considerably exceed the minimum requirements.

Age	Weight, kg	Calories	Protein, g	Vitamin A, IU	Iron, mg
0–2 months	4	kg × 120	kg × 2.2	1 500	6
6 months to 1 year	9	kg × 100	kg × 1.8	1 500	15
1–2 years	12	1 100	25	2 000	15
4–6 years	19	1 600	30	2 500	15
Adult male	70	2 800	65	5 000	10
Adult female	58	2 000	55	5 000	18
Pregnancy		2 200	65	6 000	18
Lactation		3 000	75	8 000	18

2). Often there is a lack of several different nutrients at the same time, producing complex pictures, for example, a combined lack of calories, protein, iron and vitamin A. The most common, widespread and dangerous types of malnutrition, especially among children, are those caused by lack of calories or protein or both (protein–calorie malnutrition, PCM).[1, 2, 3] In the following remarks these types will be given special attention.

Practically always the underlying cause of PCM is a combination of dietary inadequacies *and* chronic or repeated acute infections. Small children have a high rate of infections before they have acquired immunity to the infectious agents in their immediate surroundings. Either of these two factors is potentiated and made worse by the other. An underfed child (for example, suffering from starvation at the breast) is

Table 2. Different types of malnutrition in developing countries, and the nutrients predominantly involved.

Protein–calorie malnutrition (PCM)	
Kwashiorkor	Protein
Marasmus	Protein and calories
Mild-to-moderate PCM	Protein and calories
Vitamin-deficiency diseases	
Xerophthalmia	Vitamin A
Beri-beri	Vitamin B_1
Ariboflavinosis	Vitamin B_2
Pellagra	Niacin
Scurvy	Vitamin C
Rickets	Vitamin D
Mineral-deficiency diseases	
Anaemia	Iron
Goitre	Iodine
Rickets, osteomalacia	Calcium

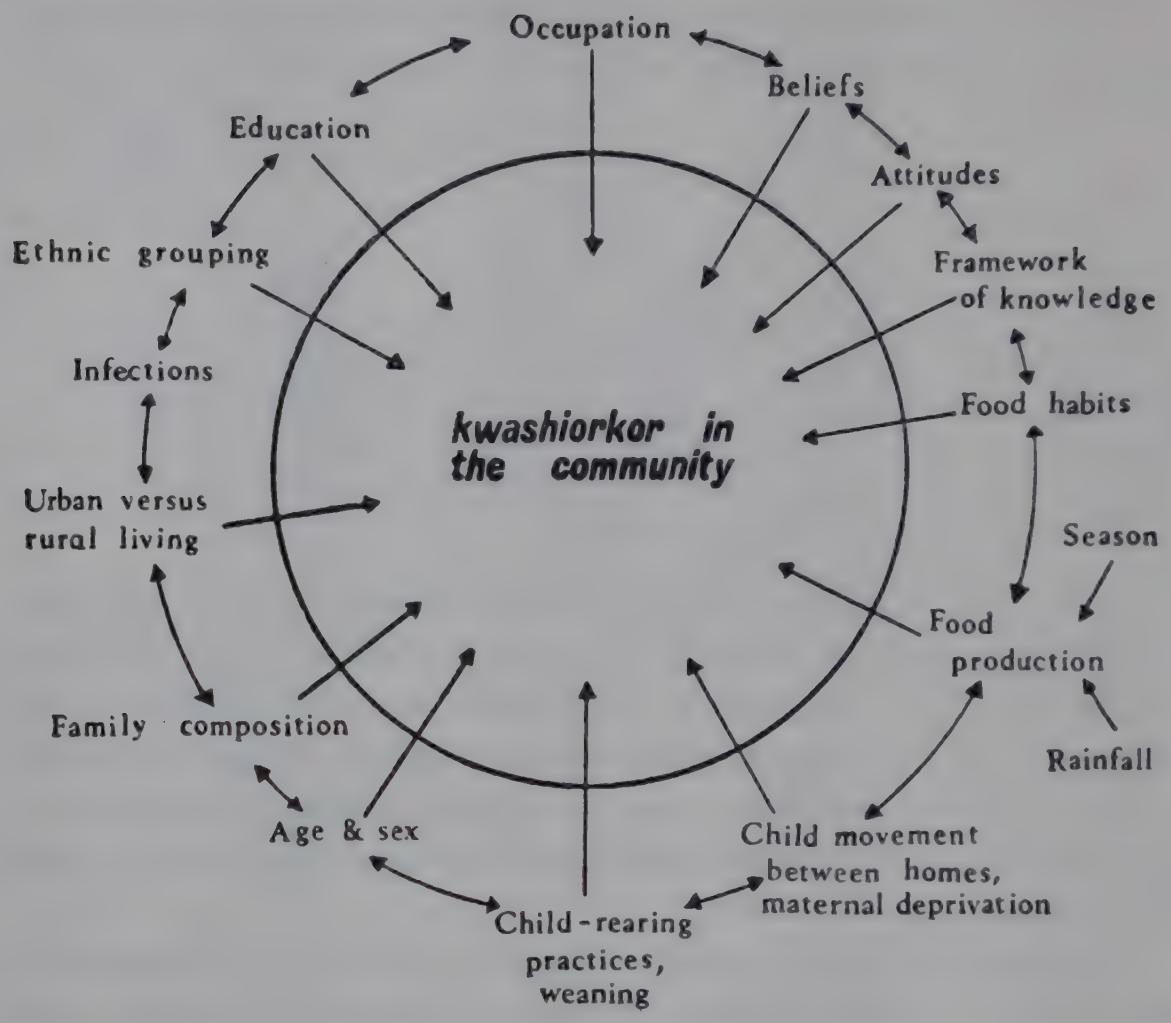

Fig. 1. Factors relating to the rate of malnutrition in the community (from M. King: *Medical Care in Developing Countries*, Oxford University Press, 1966).

more susceptible to infection and vice versa: repeated acute infections or chronic infections lead to malnutrition.

In the background of these two main factors, underfeeding and infections, there are a number of conditioning factors which directly or indirectly decide (*a*) the prevalence of malnutrition in the community, (*b*) the type and severity of malnutrition, and (*c*) the prognosis for the future. Most of these factors have an intricate relation to each other and most of them also influence one another (Fig. 1).

Short-term effects of malnutrition

During the first few months, the infant develops well, provided there is a good flow of breast milk. However, from the age of about 5–6 months, there will be a pause in the growth of a high percentage of children. The weight curve flattens off. The breast milk is now no longer suffi-

cient alone, and additional food is most often inadequate. Also infections start to become more frequent and particularly diarrhoeas.

The majority of children who do not belong to privileged families now start to develop a mild-to-moderate PCM. Some will develop a more severe type—marasmus, kwashiorkor or an intermediate form. Finally, some will receive sufficient calories and nutrients and have only a few mild infections and will develop well.

The proportions of these categories vary, of course, with the background factors, as was discussed previously. At any given moment in a rural community, one may find up to 5% of the children under 5 years old suffering from marasmus or kwashiorkor. In the age group 1–2 years, most often 50% or more have a mild-to-moderate form of PCM.

A child with typical *marasmus* is seen in Plate I (*a*). It is usually under 1 year old. It may have been born prematurely or "small for date", due to the fact that his mother was poorly nourished during her pregnancy. He was probably not breast-fed for long but was given diluted and contaminated cow's milk by bottle and has consequently had diarrhoea many times already.

A marasmic child is usually suffering from a starvation diet with ensuing balanced malnutrition. The intake of both calories and protein (and other nutrients) has been low. The child has practically no fat, his muscles are wasted and his skin hangs loose and seems to be too big for his body. He has an "old man's face". There may be associated signs of vitamin or mineral deficiencies, depending on his previous diet. All the organs and tissues in the body are affected. The intestines are damaged and the food will be poorly digested for a long time. This often concerns the sugar in milk (lactose), which cannot be broken down, resulting in diarrhoea. This is serious, as milk is an excellent and often necessary food for the recovery of individual children, as well as for mass feeding in times of starvation. The regeneration of the red blood corpuscles may be considerably slowed down, resulting in anaemia. The resistance to infections is markedly decreased.

Plate I (*b*) shows a child with *kwashiorkor*. This disease usually occurs in children 1–3 years old. Often the child has suffered from mild or moderate malnutrition from the age of 6 months and may have become gradually weaker from being fed weaning foods poor in protein (for example, porridge made from cassava, plantain or maize only) and through a series of infections. Any simple infection may precipitate

a child from a condition of moderate malnutrition to kwashiorkor. Measles has an especially bad reputation in this context.

The child shows a retarded growth and the muscles are flabby and wasted, but the fat under the skin may be preserved, indicating a sufficient calorie intake. There is always swelling of the feet and lower legs. The child is miserable and apathetic. Very often the hair changes colour to red, brown or grey. It becomes sparse and straight and can be pulled out easily. The children have a "moon face"; the skin looks pale and may have a rash. The liver is fat-infiltrated and there are severe metabolic disturbances. Other complicating deficiencies are common, for example, vitamin-A deficiency, causing eye lesions, and iron deficiency, causing anaemia.

Plate II shows a child with *moderate PCM,* with moderately retarded growth and some of the signs of marasmus or kwashiorkor, although they are not fully developed.

In *adults* PCM is much more uncommon and the overt, clinically visible forms are seen mainly in times of starvation.

During *pregnancy* the mother's nutritional status may affect the child in different ways. If poorly nourished, she does not build up the necessary reserves in her own body (poor weight increase) to draw upon later during lactation. The foetus may also be deprived of certain nutrients, for example, vitamin A and, if the mother is in the same poor state of health during lactation, the child may develop signs of malnutrition early. The birth weights of the children of poorly nourished mothers are, on the average, also lower than those of the children of well-fed mothers, which presumably gives these children a worse start.

In many communities, repeated and frequent pregnancies are common and in between there are long periods of lactation. In the long run, this will result in a nutritional drain, deficiency diseases and premature ageing.

Malnutrition contributes very much to the generally high child-mortality rate, although this is not obvious from vital statistical data, even from hospitals. The death rate from marasmus may be up to 50%, even with good hospital care, and from kwashiorkor around 15–20%. A large number of children die because their resistance to disease is reduced by their poor nutritional status. They lack the reserves of protein needed to carry them over the period of their illness. In well-nourished individuals, acute disorders have usually run their course

before any nutritional deficiencies that may have developed become apparent, but in poorly nourished individuals the deficiency is immediately significant. Malnutrition and infection join forces, often with fatal results. Deaths from respiratory and intestinal infections, which involve serious losses of protein nitrogen, are 20–50 times more frequent in the 1–4-years age-group in developing countries than in industrialized countries.

This high morbidity and mortality place a great strain on the scarce medical resources. Expensive hospital beds are occupied for weeks by badly nourished children, who in principle need only food, and outpatient departments and health centres are loaded with patients with "avoidable" diseases. Primarily, however, it involves severe human suffering and grief. There are innumerable unnecessary deaths and, for the survivors, the risk of permanent sequelae.

Long-term effects of malnutrition

Great attention is being focussed to-day on the long-term effects of malnutrition, as they may have serious implications also on the level of national development. The research in this field is only in its beginnings and many questions must be left unanswered. A few examples may be mentioned.

Blindness. Vitamin-A deficiency, with low levels of vitamin A in the breast milk and weaning and toddler food poor in vitamin A, may lead to keratomalacia and blindness. This is a serious handicap, leading to dependence on others and no productivity. This can be seen in the midst of plenty of the right kind of food (paw-paw and palm oil not used, due to ignorance).

Skeletal deformities due to *rickets,* may cause pelvis deformities in girls, and thus, later on, complicated childbirths. Rickets, which can easily be prevented by exposing the skin to sunshine from the age of a few weeks, has been found to be very common in North Africa, in Ethiopia, and in other (sunny!) African countries.

Iron-deficiency anaemia is common in growing children and in adult females. There is a variety of causative factors, including a diet poor in iron and animal protein, a large iron drain due to hookworm, and frequent pregnancies. Although a certain adaptation may take place,

anaemia means decreased working capacity in the school, the factory or the field.

Goitre due to iodine deficiency in the food and in the salt is a common problem in many African countries. It starts in childhood and in certain areas a high proportion of school-age children and adults may be disfigured by enlarged thyroid glands on the neck. The remedy involves the iodization of all distributed table salt and is thus a question of national policy.

From the public-health point of view, the most serious long-term effects of malnutrition are those caused by *PCM at an early age.*

Adult stature depends on a large number of biological determinants, including sex, parental size, genetic constitution, and a number of environmental factors. In certain groups, such as the pygmies of Ruanda or their very tall neighbours, the Tutsi, there are extreme examples in which genetic influences predominate. However, recent research work supports the theory that environmental influences decide whether genetically determined potentialities are fully realized or not.

Thus, the physical dimensions of the body are much influenced by nutrition in early life. It has been shown from many regions and from many ethnic groups that the children of elite parents of high socio-economic status do not differ from well-fed and well-cared-for children in the USA or Europe. However, if there has been poor nutrition during the first year, then the final stature and body proportions of the individual are more likely to be reduced. If growth is interrupted by a period of sickness or malnutrition later in life, there is a good chance of catching up later with better feeding during recovery. The most serious long-term effects are, of course, those permanently affecting the intellectual functions and the learning capacity (see the previous paper by Vahlquist). But also the day-to-day effects of hunger mean a good deal. It is an every-day observation that children who are on a restricted diet show little activity and lack of energy. They don't play, they just sit. These children in the pre-school age are losing part of the most important period of education. By this apathy, the child in his turn does not act as a stimulus to his mother, so apathy in the child may produce apathy in the mother. This may have consequences for stimulation, learning, maturation and future relations.[4]

References

1. Blix, G., Hofvander, Y., and Vahlquist, B. (eds.): *Famine. Nutrition and Relief Operations in Times of Disaster. Symposia of the Swedish Nutrition Foundation* IX. Almqvist & Wiksell, Stockholm 1971.
2. Jelliffe, D. B.: *Infant Nutrition in the Subtropics and Tropics.* WHO, Geneva 1968.
3. King, M. (ed.): *Medical Care in Developing Countries.* Oxford University Press, 1966.
4. Scrimshaw, N. S., and Gordon, J. E. (eds.): *Malnutrition, Learning and Behavior.* MIT Press 1968.

Malnutrition and the Community

By KARL ERIC KNUTSSON*

In this paper a social anthropologist explains the necessity of careful mapping and analysis of the sociocultural environment before launching any major nutrition programme. He comments on the difference between the traditional rural society (subsistence economy), the rural society in transition and the urban situation, and expresses concern that a too narrow and predominantly technical approach may cause greater harm than no interference at all.

In discussing malnutrition in relation to its social and cultural environment, I shall take certain things for granted, in order to be able to keep my contribution within acceptable limits.[1] Thus, I have assumed that we all share the conviction that nutrition is an important matter in development planning and development work. To be sure, we all need to increase our knowledge of why it is important, but I take it that no one will question the assumption that it deserves close attention.

I have also assumed that we are all aware of the complexity of nutritional problems. Agriculture, animal husbandry, fisheries, food industry, biochemistry, clinical medicine, public health, social science, education and the mass media should all be represented in a list detailing the complex and integrated nature of nutrition. At the same time this list will indicate the scope of the task confronting us, if we wish to discuss "malnutrition and the community". How are we to relate all the various aspects of nutrition to the comprehensive and vague concept of "community"? And how are we to do this in such a way as to clarify rather than obscure the interdependence of malnutrition and the socio-economic and cultural environment in which it exists?

The only way to do this, I think, is to try to avoid, as much as possible, discussing our problems in abstract and generalizing terms. Instead we should keep in close touch with the concrete facts and the

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actual contexts in which malnutrition occurs. If we choose our cases and our data from representative types of African communities to-day, we shall still have the opportunity to abstract and generalize, if we wish to do so.

In other words, if we want to make our views on malnutrition and the community relevant to planners, politicians, administrators or different kinds of nutrition experts, we must be careful to specify *which* community we are talking about. Without doing this, it will be impossible to determine what the *actual* relations are between a nutritional pattern and the wider surroundings in which it exists and has been produced. Furthermore, it is quite obvious that we cannot even approach the question of what can and ought to be done, if we do not see and understand the problems of malnutrition against the background of a thoroughly mapped and analysed environment.

Reflexions of this kind have led me to formulate my contribution on the basis of three different socio-economic contexts, which, I think, represent the major types of communities on the African continent.

The rural "subsistence" community

As the first scene for my malnutrition-and-community theme, I have chosen a fairly "unchanged", rural community, populated by settled agrarian people. The settlement may be in villages or in more scattered homesteads. Regardless of such differences, this kind of community usually exhibits a high degree of homogeneity in language, livelihood and customs. The economy is of the subsistence type, in which the predominant part of what is needed for survival is produced by each management unit, most commonly the household, which is also the most important element in the social organization of the community. Other characteristic traits are kinship or descent organizations, which form vast networks, linking together individuals and groups through bonds of rights and obligations.

I must keep my promise to be concrete, so let us think of an imaginary community of this kind. Let us furthermore start very simply with a sketch of the opportunities for consumption that a subsistence economy offers and, at the same time, let us stop at each point where a drain or a reduction of the potential food resources can be identified. In this way, I think that some of the interrelations between nutritional

problems, on the one hand, and the technology of production, the economic organization, the system of social obligations in a rural community, the pattern of family life and, last but not least, the body of traditional knowledge and beliefs, on the other hand, can be pointed out.

Nutrition and the technique of production. The yearly production cycle can be roughly divided into five main technical phases. The first one is sowing. Even during this phase, reductions of a potential result can easily be spotted. The seeds may be broadcast and thus not evenly distributed on the ground. The cows may be driven over the field in order to cover the seeds, with the result that some are trodden deep down and some remain on the ground to be picked up by birds. During the next phase, the growing of the crop, the reductions and the drains continue. Plant diseases, insects, lack of weeding, all contribute to the decreasing of the potential output. The technical problems during harvesting and threshing are perhaps not quite so great, though the farmer often tends to wait until his crop has become fully ripe or overripe and is therefore easily damaged by rain and hailstorms. During the last phase, that of the storing of the crops, the losses increase again. In fact, as has been pointed out by many observers over the years, lack of an adequate storing technique may be the most important deficiency in this type of community.

Nutrition and the economic environment. Having illustrated all these losses, which are caused by difficulties in mastering technical problems, let us take a look at the economic sector. Though here we are concerned with the losses of food, in comparison with the food-production potential, that the subsistence community suffers, we must not forget that the time of harvest and threshing[2] is the only time of the year when the farmer has any resources in hand. The needs that he has to meet with these resources, are, however, manifold. First of all, he has to sell some part of his crop, in order to be able to pay his land taxes. As most farmers are forced to pay their taxes at roughly the same time, this leads to a lowering of the price that he could otherwise have got for his crops. As a consequence, his potential resources are considerably reduced. One may wonder why taxes have to be paid in this way. One simple reason is, of course, that, if the farmer were not

forced to pay his taxes after the harvest, he would not be able to pay at all.

A large part of his crops is also put on the market at this time, in order to repay loans that had to be raised during the sowing season, when he often does not have enough seed left for sowing, or during the growing season, when he has not enough grain left for food. In many communities of this kind, the farmers also meet with difficult marketing problems. To varying extents, they are in the hands of the traders on the village markets, who co-operate and set upper price limits for the purchasing of crops, in order to maximize their profits. As the traders and their organizations, whether formal or informal, are usually strong, the farmers are forced to sell their crops at low prices, because of their inability to transport the crops to markets where higher prices are offered.

In addition to these external factors outside the control of the farmer, which ultimately determine the level of his economic standard, a few words ought to be said about the kind of "budgeting" situation that a subsistence farmer is faced with and has to manage. He may, for instance, be well aware of the health problems that he has in his family and he may also be convinced of the need to allocate resources for the solution of these problems. At the same time he is forced to consider a lot of other problems which in varying degrees pose threats to the existence of his household. In his own analysis of which problem is to be considered the most serious threat, he has to decide about priorities. This may in the end cause him, quite contrary to his wishes, to invest his resources in a new pair of oxen or in a feast, by which he can maintain the necessary ties of friendship and solidarity and to secure future help, instead of sending a member of his family to a hospital.

Nutrition and social obligations. All the economic obligations of the farmer and the sub-optimal way in which he has to solve them cut deeply into the food resources. Similar serious drains are also caused by the farmer's social obligations. As I said above, the time of the harvest is the only time of the year when the farmer has any resources and a surplus of high-quality food. It is only natural that the big feasts, the weddings, the commemorations and so on should take place during this period. Feasting and entertaining are also one of the few ways in

which an individual in a subsistence economy can demonstrate that he is a man to be reckoned with. Because of this, a large proportion of the food resources is consumed in different forms of status consumption. The eating and heavy beer-drinking during such feasts constitute, from a nutritional point of view, an over-consumption, by which a lot of food is consumed during a limited period without contributing to raise the nutritional standard of either the individual or his household. Usually only the adult men and some of the women participate in this consumption, whereas the rest of the women and especially the children do not get their share of the food.

Nutrition and family pattern. The processes of continued reduction over the year of the food available for consumption do not constitute the whole background to the problem of starvation and malnutrition in the subsistence community. It is equally important to note that the food that is actually available for consumption is not evenly distributed. First, good-quality food, as I just said, is normally kept for social or ceremonial consumption, whereas the normal diet is lower in quality, both in the farmer's evaluation and in that of the nutrition expert. Furthermore, the pattern of food distribution within the consumption group, which is usually the family, adds to the picture of inequality. Especially the child stands out as an under-privileged member of the family and the community in terms of nutrition. Usually the child gets the least food and gets it last. Actually, when there are guests in the house, nothing may be left for the child. In communities where children start early to assist in looking after cattle or collecting firewood in the bush, the irregularity of their meals does not improve the situation.

Nutrition and traditional knowledge. The environment in which a nutritional pattern has been produced and is maintained does not consist only of ecological, economic, and organizational factors. The environment is also made up of the knowledge and the body of beliefs about man, health and disease, food and other aspects of life that every community has accumulated. The outside specialist, whether he is a national or an expatriate, often does not recognize the importance of this factor in the environment. But there are, indeed, good reasons why the planners of nutrition programmes should carefully record the theories that the people in a target community have themselves produced and

believe in. First, we shall almost always find ideas and beliefs that contain sound knowledge based on correct analysis, also from the point of view of the nutrition expert. The identification of such knowledge will provide an opportunity to establish contact characterized by mutual respect—the respect of the outside development worker for the correct analysis made by the people of the community under unfavourable conditions and the respect of the local people for the outsider because of the sincere interest he has demonstrated in their ideas on the matter. Secondly, also those ideas and beliefs which from a scientific point of view are false must be carefully studied and documented. Otherwise the choice of realistic strategies of approach and efficient ways of co-operation will be impossible.

A great deal more could be added about other aspects of the complex of nutrition and the structure of a rural subsistence community. What I have tried to say so far will nevertheless be sufficient as an introduction to the discussion later on of what can and what ought to be done in this type of community. In that discussion one of the basic questions will concern what can be done immediately within the existing structure of the rural society and what can be done only after radical changes of this structure and the wider national framework in which it exists.

The "changing" rural community

The kind of community that we have so far considered is quite clearly decreasing, both in number and in importance, on the African continent to-day. Let us therefore focus our attention on another form of social life that, on the contrary, is becoming more and more common all over the African countryside.

I am thinking of a community where economic development has been initiated through the introduction of cash crops and the accompanying monetization of the local economy, regardless of whether this has happened through planned change or "spontaneously". Again running the risk of over-simplification and over-systematization, I shall try to sketch some typical traits which occur in this process of change and try to view the nutritional situation against the background of these traits.

In the rural subsistence community which I discussed above, there is often a marked egalitarian pattern on the local level. I do not mean that economic differences are unknown but that they are not on such

a scale that they have produced socially and economically distinct classes and greatly varying social and economic opportunities for the individual. With the introduction of a new element in such a community, whether it is a cash crop, a new technique of production or something else, a radically different situation is created. One of the most characteristic traits is the establishing of what I should like to call a new *opportunity threshold.* By this, I mean that some people in the local community or some of the immigrants following in the footsteps of change will have adequate means in terms of control over land or over people or financial resources to be able to make use of and profit from the changed situation. They will, for instance, control enough land and capital to produce enough coffee, in order to avoid becoming dependent on local traders and moneylenders. These people, who in this way happen to be on or to manage to step over the opportunity threshold, will form the embryo of an emerging upper class in a formerly basically egalitarian community, whereas those who do not reach this threshold will, at different speeds, be eventually reduced to a resourceless, landless class, becoming increasingly proletarized and dependent on those who control the resources. This transition will necessarily take place unless defensive actions against it are efficiently organized in the forms of protective legislation, co-operative organization and the like.

Nutrition and changes in the production pattern. If we look at the pattern of production in a cash-crop community, we shall see that there is a marked tendency towards a decrease in the number of types of plants grown, and consequently an increasing predominance of monocrop production. In areas where, for instance, coffee was primarily grown for household consumption, a large number of plants, such as pulses, beans, cereals and vegetables, provided the household with the bulk of the food that was consumed. With the transformation of coffee into a cash crop, the growing of most, if not all, complementary plants is abandoned, in order to provide land for the crop that produces the income. Most of the food needed has to be bought. The cash-crop farmer is in fact, in his role as food consumer, transformed from a "farmer" into an urban consumer, who has to depend on a cash income for his survival.

But it is not only those who go over to the new form of production

who are exposed to radical changes. Many communities in a neighbourhood where the conditions for cash-crop production may not be suitable are also affected. The explosive demand for food, both from the cash-crop-producing farmers and from the seasonal labour force, will lead to rapid changes when earlier subsistence communities are transformed into food producers for the coffee- or cotton-producing villages. In a way, they also become cash-crop communities, with the difference that in these cases the monocrop consist of food plants intended for sale at the local market. Apart from this difference, we shall find the same tendency towards the production of the highest-yielding crops in terms of quantity and the reduction of the not-so-profitable species. This is certainly part of the reason why the production of maize, for instance, is on the increase wherever it is feasible to grow it, and also why nutritionally more valuable plants are not getting the attention that they should have. Obviously, the effects are nutritionally destructive and especially so in situations in which balanced production did not even exist before or, if it existed, was precarious.

Nutrition and the household budget. If we turn our attention next to the economic sector and especially that of the household-budget situation in a community of this kind, we shall find that one characteristic trait, which we have already noticed in the subsistence community, has been further strengthened. I am thinking of the serious lack of balance in the yearly rhythm of earning and spending. For the upper, resource-controlling class of the cash-crop community, this poses no serious problem, whereas for the landless, the tenants and the daily labourers, it constitutes a constant threat to their economic viability and thereby to their whole existence. For the latter categories, the bulk of the income will be concentrated in the harvest season. Here we also find the bulk of the spending. But, in comparison with the subsistence community, where we noted a similar tendency, there is one important difference. A foodstuff that I produce myself for my own consumption and for which I have a system of storage—however poor—is more easily stored and thereby more evenly utilized over the year than a sum of money that I earn in a relatively short period of time and for which many needs and temptations compete. I shall not dwell here on the nutritional consequences of devious trading practices, whereby the money earned by hard work during the harvest of coffee, peanuts, cotton

and the like, is sucked back into the pockets of traders and land-owners by the sale of many unneeded but tempting consumer goods. It is enough to contemplate the serious effects on the household budget and thereby on the nutritional well-being of the family that this dramatic imbalance will have.

Nutrition and changes in the division of labour. In many areas where the economy has become monetized, women are being increasingly drawn into either wage labour or other extra-household activities. Although I am not in the least arguing against such a change, I want to mention briefly some of its implications from a nutritional point of view. I shall do this by summarizing certain changes in food-preparation technique reported from among the Baganda in Uganda. Among the Baganda the carbohydrate-rich *matoke* banana needs to be boiled before being consumed. Traditionally, a great many varieties of vegetables and beans were grown in the banana gardens. These were usually steamed on top of the *matoke* pot. Nutritionally this is a very good method of preparation, as it preserves many qualities which would be lost if boiling directly in water were practised. When the Baganda started to grow more coffee in their banana gardens, the growing of complementary plants rapidly decreased. At the same time the women's extra-household activities increased, with the combined result that the food needed to balance the weaknesses of the *matoke* became more scarce and the time-consuming but less destructive traditional way of food preparation was abandoned.

Apart from the aspect of change for which I chose this example, it also illustrates the important but often forgotten fact that malnutrition is to a great extent a by-product of what is called economic development. This lends further weight to the demands that development planners should recognize their duty to construct defences against such unintended and certainly unwanted consequences.

To summarize what I have tried to say so far about certain environmental factors in the nutritional pattern of a rural cash-economy community, the first point that I would like to stress is the in many respects increased vulnerability that accompanies the transition from the subsistence situation. I do not want to minimize the problems faced by the members of the purely traditional rural community, but they do have certain advantages which the citizens of the cash-crop society

have to a great extent lost. They have, down the ages, been confronted with basically the same problems of ecological adaptation. They have had the opportunity to look into and analyse their problems—and within their often very limited physical resources and on the basis of often inadequate knowledge, they have tried their best to solve them. In some sectors at least, they have managed to do so and have thus achieved some kind of balance. But in the monetized and rapidly changing community, the situation is completely new and unknown. Most of the time, the flow of resources is completely beyond the control of the majority of the community members. The problems are unforeseen and impossible to cope with on the basis of existing knowledge. Defences against the many new dangers and risks have not been built up, either on the national or on the local level, although great efforts are being made to do so. Together, all these deficiencies combine to generate what, for lack of a better term, I have here called an increased vulnerability—economic, social and nutritional.

The urban situation

What urban community? If I have not succeeded in doing anything else by what I have said so far, I have, I think, certainly succeeded in showing how difficult it is to describe the relations between a nutritional pattern and various aspects of the community in which it exists. In its turn, this difficulty creates tremendous obstacles to the formulation of any theory that could be translated into direct practical action. These difficulties rise to giant proportions when we contemplate the urban situation. We may, for example, plunge into a discussion of what is meant by the term "urban". This, I think, we had better leave to the social scientists. For the present purpose, it may be enough to use the term to denote the way of life that people live in the forms of settlement that we call cities and towns. What we cannot, however, avoid is the fundamental question of *what* urban situation we wish to consider.

Are we to include the early stages of urbanization that can be observed in the rural market villages and towns? Then much of what I said above about the cash-economy rural community would also be valid in a description of this urban situation. Is the urban community that of the migrant worker of the mining zones in Africa, who leaves

most or all of his family behind and stays in the town for part of the year or for a limited number of years, after which he will return to his homeland? Or is it the community of the recent permanent immigrants gathering in the shanty towns, with their high percentage of unemployment? Or is it that of the more established urban dweller, fully adjusted to life on a salary and the pattern of spending in the ubiquitous urban markets? Or do we mean the situation of the middle- and upper-class urban elite, who have access to both the means and the knowledge needed to minimize their health problems and also, one hopes, the basic problems of nutrition?

If we look at the urban situation in this way, as many different situations, it becomes clear that even a preliminary discussion of the interrelation between malnutrition and the urban community will require more space than I have at my disposal here. Let me instead approach the problem by pointing to some problems of a more general nature that must be taken into consideration in any analysis of nutrition involving an urban community. I should also add that naturally many of the observations that I have made on the two previous socio-economic contexts are valid in the various urban situations.

Nutrition and the problem of population mobility. It is not only when people move into the cities that we have to consider the problems generated by population mobility. True, great strains are placed on both the individuals and the families involved in the process of migration. Many families actually break up, either through the mother and children settling in a town and leaving the father behind or through the father and maybe some of the older children migrating and leaving the rest of the family in their community of origin. A survey made in Addis Ababa in 1965 showed that the percentage of separated families during the resettling process could be as high as 66%. We all acknowledge the importance for the child's physical and mental well-being of the stability of the immediate social group in which it grows up. The frequent breaking up of such groups in the process of urbanization is certainly one important factor—although it is difficult to assess—also in the understanding of the nutritional situation.

Furthermore, as I have just indicated, once people have arrived in the town, they enter into another process of mobility. Because of the scarcity of resources, the dependence on earlier settled relatives and

friends and the need for a flexible strategy in searching for an urban income, the pattern of settlement often exhibits a very high degree of mobility, even among those who are not fortunate enough to succeed in getting better jobs and who therefore move away from the districts where they first settled. Investigations carried out in cities such as Freetown in Sierra Leone and Addis Ababa indicate that people often change their homes three or four times during a year, although they tend to stay in the same part of the city. I do not need to point out the difficulties that are created in this way for the utilization of health and nutrition services or the effects that such mobility will have on any attempt to reach, inform and mobilize the people for development programmes.

Nutrition and the economy of the wage-earner. Earlier I used the term "opportunity threshold" to distinguish between two different socio-economic strata in the cash-economy community. I may as well return to that concept in my comments on the household economy in varying urban situations. Here also the major cleavage will be between those households which have access to an adequate and continuous income and those who do not reach the threshold, either because they have no income at all or because it is either too small or too irregular.

Above the dividing line the households will be able to meet their basic needs of housing, food and clothes. They will also accept innovations on the basis of new and convincing information. They may, for instance, be supposed to consider the quality of food in relation to its price and not only to take into account the quantity that they get. This is, of course, provided that the surplus that they command is not reduced or completely annihilated by the economic obligations that the household members may have towards not-so-fortunate relatives and other dependents.

In contrast to these households, the majority, who usually do not reach the opportunity threshold, cannot be expected to prefer the quality of food to the quantity, even if they know they ought to. Food will be bought that can provide bulk, food will be diluted in order to "stretch" it, and so on. The attitude towards innovations that require an allocation of scarce resources will be negative. To this I should add the many risks created by the crowded conditions and the absence of adequate hygienic facilities, which, in their turn, will further in-

crease the risk of malnutrition and the damage caused by it, once it has become acute.

Local leadership and nutrition programmes. Studies of the pattern of local leadership are necessary in every attempt to initiate nutrition activities in any community, whether it is basic research or various forms of applied nutrition programmes. The problems involved in this sector of community life are especially important and at the same time exceedingly difficult in the urban situation. It is my experience that this statement is valid both for research work and in practical programmes. The reason for this, I assume, is to be found in the different nature of the local community leadership that one finds in an urban setting, in comparison with the rural types of community that I have discussed. Although in many urban areas the recruitment of new immigrants may follow traditional rules based on tribal, regional, kinship or other principles, people are on their own in quite a new way, once they have settled in a town. Each household acquires a new independence in decision-making, even if it belongs to the very poorest category. People move in and out of the community. Knowledge of each other and each other's activities is much less than in the rural homeland. The uniformity of knowledge, interests and action that one would find in the rather homogeneous rural community is replaced, in practice, if not in theory, by a strengthened individualism. The need for collective co-ordination has also drastically decreased. All these changes have left their marks on the forms of local leadership, which is much weaker than both the traditional offices in the tribal communities and the strong-man leadership that usually predominates in the changing rural communities. At best, the local urban community has developed self-help associations and development committees. At worst, no forms exist for the co-ordination and direction of local interests and resources. At the same time the officials of the town administration are too far removed from the various local communities to be able to fill the vacuum created by the weak local leadership. The administration is also faced with overwhelming obstacles, caused by the combination of high mobility and increased independence. The only solution of this dilemma is quite obviously the creation of an efficient political or co-operative organization, through which the citizens can be reached, informed and mobilized for development efforts, for instance, in the field of nutrition.

Nutrition and the dual man—peasant and townsman. I have concentrated my remarks on nutrition and the urban situation on some of the economic and political aspects that are relevant for the description and analysis of malnutrition in an urban setting. In doing so, I may have stressed the differences between the urban and other types of community. This should not overshadow the fact that there are many similarities. This is especially true in the sector of knowledge and belief. The urban immigrants do not change overnight because they change their housing, work and clothes when they move into the town. In essence, they share much of the knowledge and many of the values of the society in which they grew up and where they still have many relatives. In some ways, the individual will not become a townsman only but a peasant and a townsman at the same time. If we like, we may call him a dual man, oscillating between two types of social organization and two different traditions of knowledge. In one situation he will rely on one of the two, in the next he will follow the other. He may, for instance, not be opposed to what he learns from a nutrition-information programme, but at the same time he will still continue to act according to the rules that he learnt early in life from his parents and grandparents. We still know too little about the mechanics of this switching, but it is definitely a problem that will confront anyone engaged in nutrition education.

To summarize once more, I want to stress two points in connection with my discussion of nutrition in an urban setting. The first is the dramatic difference in many cities between the "haves" and the "have-nots". The latter, who live in what Oscar Lewis has termed "the culture of poverty", are more or less completely left out of the process of development. It would take enormous energy and resources to build up a service system in the field of health and nutrition, not to mention other vital sectors, in order to improve their lot. This pessimistic remark leads me on to my second point. I have here discussed rural and urban problems separately. I have done so only in order to give my contribution a manageable form. But I would be the first to admit that such a division is false and misleading. Urban and rural problems belong to the same continuum. This implies, as regards the urban situation, that the fundamental problems of nutrition, as well as of environmental medicine, housing, employment, education and so on, can be solved for the really vulnerable groups only when fundamental rural problems,

such as the control of land and other resources, are solved and thus a basis for the restriction of immigration to urban areas is established. Until then, however, special efforts in the field of nutrition should certainly be made also in urban areas.

Conclusion

The logical conclusion to the views that I have tried to present would have been to look at the three different types of community sketched, for the purpose of investigating what should be the priority sectors in the fight against malnutrition in each one of them and the work strategies that may be considered to be feasible. However, I must leave the consideration of these questions to other contributors. Let me instead, in order to minimize any misunderstandings, briefly tell you what I did *not* intend to do.

I did not intend to advocate the need or the importance of social scientists in nutrition work. To my mind, specialists should avoid dwelling on the importance of their specialities. The only way to establish fruitful co-operation is to acknowledge the importance of all the many aspects of our problems and to unite in attacking them.

Furthermore, by concentrating on the complexity and the integratedness of the whole question of malnutrition and community, I do not wish to diminish enthusiasm in any way or to discourage the will to act, although I know that "to complexify" problems may have this effect. On the contrary. I am deeply concerned lest the still-widespread tendency to choose a narrow, highly specialized and preferably technical approach to many problems of development should do greater harm than if the deficiencies were left completely without attention. In this respect, the expatriate experts and national development planners who want immediate results have been equally great sinners. In the last analysis, reality itself will correct any distorted or over-simplified picture of itself. That is a worse experience than the frustrations that we may suffer when we realize the complexity and the scale of our problems at the beginning of our work.

Notes and references

1. This paper was conceived and written for an audience of planners, economists, and health workers. I have therefore consciously tried to avoid both academic

jargon and the usual academic apparatus. The experience upon which it is based has been mainly gained during anthropological field work and during work in various posts at the Ethiopian Nutrition Institute. Aspects of this work have also been reported in the following papers:

Knutsson, K. E., and Vahlquist, B.: Medicine and Social Anthropology: Some Notes on a Joint Attack on Nutritional Problems in Ethiopia. *Acta universitatis upsaliensis*, 1968: 17, 376.

Knutsson, K. E., and Mellbin, T.: Breast-feeding Habits and Cultural Context: A Study of Three Ethiopian Communities. *J. Trop. Pediat.*, 1969: 15, 40.

Knutsson, K. E., and Selinus, R.: Fasting in Ethiopia: An Anthropological and Nutritional Study. *Am. J. Clin. Nutr.*, 1970, 23, 956.

Selinus, R., Gobezie, A., Knutsson, K. E., and Vahlquist, B.: Dietary Studies in Ethiopia. I. Dietary Pattern among the Rift Valley Arsi Galla. *Am. J. Clin. Nutr.*, 1971, 24, 365.

2. These views could, of course, not be valid if we had chosen as our imaginary community one in which production and harvesting were continuous, as is the case in a yams- or ensete-producing society.

Malnutrition in its Total Setting

By DERRICK B. JELLIFFE*

Nutrition is under the influence of a great variety of moulding forces. The author presents the "community nutrition-level equation" and discusses some major factors influencing the community level of nutrition, such as food availability, economic and educational level, health services and population size.

Human nutrition is the end-result of the interaction of all aspects of the ecology, that is, the whole range of different physical and cultural factors in the human environment. Once this is appreciated, the practical question is to identify the *main factors* in the environment in the particular country, with special relation to *the practical possibility of improving them at reasonable cost and in the near future.*

In the food and nutrition "business", one may find oneself very confused, because there are so many different moulding forces which need considering, and frequently one feels lost in the complexity of the whole kaleidoscope making up the ecology of any human situation. As a guideline, therefore, it may be helpful to use what has been termed the "community nutrition-level equation".

Community nutrition level	Educational level	Economic level	Food availability	Aspects of health	Infections: Preventive services
			Population size		

This is, of course, not an equation in the mathematical sense; it is more a technical "lifebelt" to keep one's priorities afloat in a flood of circumstances. It does not cover everything but may be useful as a guide.

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In this equation, the community nutrition level is shown as being related to various factors—the educational level of the community, its economic circumstances, food availability, and some aspects of health (particularly conditioning infections, and the availability of preventive health services). The whole of this equation has as its universal denominator *population size,* which affects directly every one of the other factors. This includes not only the gross population in the country (and its rate of increase) but also the family size (and child-spacing). Now, all factors in the community nutrition-level equation are influenced by its culture pattern—in other words, the ideas, *mores,* customs, attitudes, and other aspects of the conditioned behaviour of the particular human group.

Each of these different factors is, of course, shorthand for a complex situation. The educational level includes not only the formal level of schooling and the limited technical personnel available in a country, including those in extension services, but also literacy in general.

Similarly, the economic level represents national income, as evidenced by the gross national product (and, hence, the amount of money which is available to a government for spending on whatever the government eventually decides are priorities), but also, at the family level, the amount of money available to purchase food or other items.

Food availability in the community nutrition-level equation is shorthand, both for the food available in the country as a whole and also for the food within the reach of a family, as well as the intra-familial food distribution, especially to the young child, and to pregnant and lactating women. Plainly, it is a composite of many things—agriculture, marketing, the methods and losses during storage, and processing. It will be related to the emphasis given to cash crops *versus* foods, and the nutritional value of local foods, including the protein content of the staple and indigenous legumes, as well as foods of animal origin.

Likewise, many aspects of health are related to the community nutritional level, and, of course, this in turn affects health. Two aspects need particular stress—*conditioning infections and infestations,* including measles, malaria, diarrhoea and intestinal worms, which can be so important in precipitating people, especially young children, into malnutrition, and *preventive health services,* especially maternal and child health programmes, water supplies, etc.

The community nutrition-level equation approach is, in essence, an

attempt to sort out the major factors in the local ecology on which a practical programme can be based. Obviously, this equation will be concerned with the whole community but will equally inevitably relate in larger measure to the main vulnerable groups—young children, and pregnant and lactating women.

The main nutritional deficiency in the world is very much related to protein but also (and this is something which perhaps has not been stressed enough) to calories. In fact, the inter-relation between protein and calories is something which is coming to the forefront more and more. If there are insufficient calories from other sources, protein is being "mal-used" and wasted. Moreover, the main sources of calories in traditional diets are also the main sources of protein, especially cereals. This is a vital concept. It is not appreciated nearly enough that protein is not only meat, milk, eggs and other animal products. Most of mankind, in fact, gets most of its protein (and will continue to do so including, increasingly, the people of the developed, industrialized countries)) more and more from vegetable sources, not only legumes but also cereals. Cereals, such as corn, wheat and rice, contain amounts of protein of the order of 10%.

It is, therefore, incorrect to over-emphasize the significance of animal protein. Certainly, animal protein contains all the essential amino acids, but these requirements can be met entirely without animal protein at all. Culturally, animal protein foods are, of course, very important, but nutritionally they are not necessary, as has been shown recently by a study of vegetarians—people living for philosophical reasons on exclusively vegetable diets.

Lest I appear to be advocating a sort of second-class type of diet for the less affluent parts of the world, let me mention that legumes (especially the soya bean) are, for economic reasons, figuring more and more in the dietary of the affluent parts of the world, including western Europe and the United States. The small print on many processed foods reveals that "textured vegetable protein" made of soya figures increasingly prominently.

In Africa, the ecological situation, including geography, climate, staple food and culture pattern, is so different from one country to another that the problems may be dissimilar, while, even if the problems are similar, the solutions may vary in details.

One of the main variables is the staple. An area where the staple is

of the tuber–plantation–breadfruit (TPB) group automatically presents a difficult situation for infant-feeding, because these foods are poor sources of protein (1–2%), and even their calories are diluted by the water and cellulose they contain. Under these circumstances, protein–calorie malnutrition is very likely to occur—more so than in an area where the staple is a more compact-calorie, high-protein cereal. This is shown in Uganda, for example, where the southern, more developed part of the country has much more kwashiorkor, partly because the plantain is the staple, than the northern part, where millet is the main food.

Another point which should be stressed is the immense significance of human milk as a vital food for children in all parts of the world and especially in areas with limited funds, with hygiene which is not as it should be, and with low levels of parental education. This is coming to be one of the most important points in relation to nutrition in the majority of young children in developing countries. However, there is a considerable resurgence of interest in the question of human milk in relation to the feeding of young children not only in developing countries but in all parts of the world. Many of the advantages and unique properties of human milk have been newly discovered only in the last few years. One of the most adverse and deleterious trends at the present moment in relation to infant nutrition is the decline in lactation in peri-urban areas, with a consequent increase in diarrhoeal disease and marasmus.

Variation in ecological factors has proved to be of great importance in the causation of malnutrition in different African countries, for example, water supply, surface communications, the foods available, and important parasitic and other conditioning infections. Differences in agricultural food production also enter into the picture. The present trend is towards "cash crops", which leads to vulnerability in the harsh world of international commerce and declining or, at best, unstable prices for basic agricultural products. Two conclusions can be drawn from this. There is, firstly, a need to press for more stable, assured prices for agricultural products and, secondly, a need to put increased emphasis on local food production of good nutritional quality, including cereals and legumes.

The high rate of population increase is a well-known factor and in the community nutrition-level equation one cannot just think of food and nutrition in terms of nutritional status in abstract terms but in

dynamic relation to population size, to its geometrical increase, and to family size and child-spacing.

A tremendous shift from the rural to the urban areas is now taking place in many developing countries, causing new problems altogether, which are nutritionally dangerous and of an obviously politically explosive nature. These are the new nutritional problems of comparatively recent years, related to rapid change from rural to urban community living, from a subsistence, food-growing economy, with the support of a closely knit pattern of relatives and kinship groups, to the often rather hostile world of the town, where all food has to be purchased, for which the "new townsmen" have little preparation and in which the foods most available are often those which are cheapest and most easily transported, and not necessarily the most nutritious.

Basic theme

Despite the variations in kind and degree, a common theme seems to emerge from a survey of the nutritional problems in Africa today. Firstly, to produce the most useful return on investment in food and nutrition programmes, there is always a need to make an ecological diagnosis, that is, an assessment of locally important food and nutrition problems and their causative factors. Secondly, while ecological variables must be appraised to lead to rational solutions, it is equally important to try to achieve the necessary co-operation and collaboration between the different groups and ministries which are responsible administratively for influencing the various components of the community nutrition level equation.

Thirdly, in considering a programme to improve the food and nutrition in a country, it is, at the same time, necessary to take a very wide point of view—in a regional, a national and even a world context. The food habits and trade patterns of the affluent countries affect the nutritional status of the agriculturally dependent Third World.

Part II

The Factors Involved in Solving the Problem

The general food and nutrition level in a country depends on a variety of factors, which are often special in character yet closely interrelated to each other. They range from agricultural production and food technology to marketing and economics, from medical services to education and information. In this section the authors penetrate some of these fields in some depth.

Nutrition and the Planning of Agricultural Production

By EWERT ÅBERG*

The ultimate aim of all branches of agriculture is to provide food for human beings. In the developing countries, the fast-growing populations present a great challenge to agricultural work. Until recently, attention has been focussed almost entirely on the quantitative aspects. To-day, the qualitative aspects, especially in relation to protein quality, are coming more and more to the fore. "Miracle cereals" must not obscure the important role which leguminous crops play in securing a balanced diet.

The ultimate aim of all agricultural activities is to provide food for human beings. One would therefore expect that the nutritional aspects would naturally be given due attention in agricultural planning. Yet it is only recently that the importance of such an attitude has been accepted on a national and international basis.

There are various explanations for this slow realization of a major aim. Human nutrition as a science is relatively young. Over the centuries, agriculture has been felt to have fulfilled its obligations if enough food was provided to balance the energy requirements also during the "hungry seasons". Little attention was given to specific deficiencies which were not of a highly dangerous character. Today a fundamental change in the level of ambition can be observed in the industrialized countries of the world. The aim is now to eliminate even minor nutritional deficiencies and to do this in all population groups. For a country like Sweden, this aim is well within the bounds of possibility.

But the scope has widened a bit more than this. Today it is not only a question of eliminating overt or even sub-clinical nutritional deficiencies in man but also of promoting a diet which will guarantee optimal well-being in a long-range perspective, old age included.

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These new and higher standards in human nutrition have in recent times markedly influenced agricultural planning in the industrialized countries. It is very important that the lessons learned in this process should be applied also in the developing countries, in other words, that, irrespective of the fact that many of these countries are still struggling to provide food for their citizens which will cover their minimal energy needs, they should now give careful attention in their agricultural planning not only to quantity but also to quality. For this purpose, sound nutritional aims should be their guide.

In the industrialized countries today, malnutrition due to dietary deficiency is a rare event; good nutrition and even over-nutrition are common features. In the developing countries, the situation is completely different; malnutrition is predominant, whereas good nutrition and over-nutrition are rarely found outside small privileged groups of the population. This is just as true of the developing countries in Asia and South America as of those in Africa. Many of the problems discussed in the following pages as being African problems may be just as vital for Asia and South America. They will serve to illustrate the necessity of a combination of nutrition and agricultural planning in all parts of the world and the essential activities that are needed to make such a combination effective, both from a local viewpoint and a global one.

The importance of this latter statement should not be overlooked. The nutritional problems in a country cannot always be solved by relying exclusively on domestic agricultural production. In order to reach the goal of good nutrition, agricultural planning may have, at least as a temporary measure, to consider also the necessity of supplementing the food produced in the country with imported food. However, in the discussion in this paper, the main emphasis will be laid on domestic food production.

In spite of the fact that increasing numbers of people are being attracted to the cities also in black African countries, the vast majority of the people are still to be found in the rural areas. Often the ratio of rural to urban populations is 10:1, whereas in many industrialized countries today this ratio is 1:10. For the African rural population, subsistence farming remains the predominant activity.

The special needs of the urban population must not be neglected, however. It is not only a question of the expansion of total food production

over and above the needs of the farm population. It is also a question of providing easily transportable and not so easily perishable foods, which are at the same time foods whose prices suit the meagre incomes of most city-dwellers. Unfortunately for large groups of new urban families, the total family income, even if used prudently, does not suffice to cover the minimal needs of calories and nutrients.

It was only after the Second World War that the extent of malnutrition, especially among children, in the developing countries was fully realized. In the beginning, this was looked upon primarily as a problem for the health ministries. However, it has become increasingly clear that the problem can only be solved if agricultural planners are engaged and full attention is given to the nutritional aspects.

Only if there is awareness of the problems on the part of the policy-makers can concerted action be expected. During the last two decades, considerable progress towards better nutrition has been made in quite a few of the developing countries.[5] It is only fair to acknowledge that part of this progress is the result of the work of international organizations and international agricultural-research institutes. Among the international organizations should be mentioned the Food and Agriculture Organization (FAO), the International Atomic Energy Agency (IAEA) and the Protein Advisory Group of the United Nations System (PAG). Among the research institutes, the International Maize and Wheat Improvement Center (CIMMYT) in Mexico and the International Rice Research Institute (IRRI) in the Philippines should be pointed out as having worked very successfully to increase the yields and qualities of individual crops.

Recently a Consultative Group on International Agricultural Research has been formed, with the objectives of increasing the quantity and improving the quality of food production in the developing countries. The sponsors of this group are several UN agencies, some foundations and a dozen individual countries. The funds will go to five existing international research centres (Mexico, the Philippines, Peru, Colombia and Nigeria) which have included in their programmes wheat, rice, maize, legumes, root crops and beef.

The international organizations, often in co-operation with bilateral agencies and special foundations, are very actively engaged in agricultural planning, with the aim of increasing protein supplies and of preparing guidelines for food quality and nutrition.

In this connection, it should be pointed out that all over the world there is a need for better training in human nutrition for people engaged in agriculture. Nutrition courses within the curricula of the agro-based sciences may be useful means of mobilizing an activity which will significantly influence the standard of nutrition everywhere.

Nutrition and quantity production

In most activities to secure better nutrition through agricultural planning, the quantity produced has long been considered to be the factor of first importance. The yield per hectare has dominated the discussions on agriculture's contribution to better nutrition and in the developing countries it still does to a large extent.

In a sense, the idea that a higher production, both per hectare and totally, brings with it a better nutritional status is, of course, correct. However, quantity is not enough. This is well illustrated by the countries where tubers, plantains and other products low in protein represent the major staple foods. Inevitably the children in these countries show a high prevalence of deficiency disease (especially protein deficiency), even if calories are abundant.

Food for man. On a world basis, grains are the predominant source of calories. It is of fundamental importance therefore to increase their production. This can be achieved in many ways—extending the area of arable land, improving irrigation, fertilizing, crop rotation, weed-killers, etc.—and also by improving the quality of the seeds. In this last respect, remarkable achievements have been made during the last decade. Intense and systematic work, using new and sophisticated methods, has resulted in the breeding of high-yielding varieties of maize, rice and wheat.

With the help of the new varieties of wheat, the yield per acre can be made several times greater than the yields of local varieties in a country.[3,4] This will automatically lead to an increased production not only of calories but also of protein, since for large population groups the grains are a major source of this nutrient.

Also for rice the developments are indeed promising. The new and improved varieties are already dominating the production in many Asian countries. This may soon be true also of the rice-growing countries in Africa. When the IRRI started its work on rice in 1960, the aims were

to increase the quantity and to improve the quality of rice production by breeding, using fertilizers, controlling diseases, insects and weeds and improving cultivation techniques. The work at the IRRI has so far been especially successful with regard to increasing the yields per acre by plant-breeding and improved cultivation technique. In the new varieties, however, some problems have been encountered, due to poor palatability and milling quality.

An exciting new line in the breeding work is triticale (rye–wheat crosses). Fertile types have been produced by the Indian Agricultural Research Institute in New Delhi. The biological value of the triticale protein is said to be equivalent to that of milk proteins (United Nations Economic and Social Council, E/5018, June 1971).

Feed for cattle. In many developing countries, including those in Africa, there is a serious shortage of milk and meat. When milk and meat can be had, they are often poor in quality and so expensive that the average person cannot afford to buy them.

There are two steps that are essential for increasing the quantities and improving the qualities of these two products. The first is the introduction of breeding methods for improving the cattle, both dairy cows and beef cows. The main purpose of such projects, which are already under way, for example, in Kenya and Ethiopia, is to combine the production abilities of highly bred cattle from the developed countries with the special characters of good adaptation to the prevailing environmental conditions found in the local cattle.

The second step is the improvement of the feed to be used for the cattle. Very little is gained by improving the genetic production ability of the cattle if pastures and feed concentrates of high quality are not provided. This basic nutritional fact is still taken into account only to a limited extent. When a FAO monograph entitled *The Grass Cover of Africa* appeared in 1960, it helped to focus the attention of agronomists on the importance of improving grasslands for the benefit of the cattle.[7] Today, large tasks still lie ahead in this field. Radical changes must be made in regard to the selection of grasses and legumes in the pastures, the use of cultivation and fertilization techniques, the methods of harvesting and the use of the products from the grasslands. Otherwise the highly desirable increase in the production of meat and milk will be hard to achieve. Work under way at the International Institute of Tropi-

cal Agriculture (IITA) in Nigeria, the International Center of Tropical Agriculture (CIAT) in Colombia and the Chilalo Agricultural Development Unit (CADU) in Ethiopia should be particularly stressed in this connection. It is also very desirable that groundnuts, soybeans and other grain legumes should be used more extensively to supply the livestock in the home areas with the so badly needed protein concentrates. As it is now, these products are instead sold on the international markets.

Nutrition and quality production

Even in the developed countries, it was not until quite recently that the nutritional qualities of the farm products were given full attention. The conditions in Sweden may serve as an example. During the last five decades, quality factors have been considered, but it has mainly been a question of technologically important factors, for example, the purity of the cereals, the baking and milling qualities of wheat, the malting quality of barley or the hull content of oats, the latter being important in connection with the production of rolled oats. Only in recent years has an interest in the protein content of cereals developed and only very recently has an interest in protein quality been expressed.

Thus, in developed countries quality production has long been an economically important element, due to the fact that a higher price has been obtained for a product that can be used advantageously in industry for the production of a food that suits the consumer. It has for long been the appearance of the food and the ease of using it rather than its nutritional value that have been considered and paid for. Thus, the above-mentioned quality of proteins, due to their amino-acid composition, the quality of oils, due to the presence of various types of fatty acids, etc. have not been considered in the agricultural planning until very recently.

If this is the situation in the developed countries, it will easily be understood that the ambition to achieve quality production in the developing countries has been rather limited. Again, examples can be chosen from the cereals before the time when the new varieties were introduced. Before these varieties were available, the cereals in the fields were mixtures of various types. In a wheat or barley field, there may have appeared as many as 50 or 60 types, differing from each

other in earliness, straw strength, colour, seed size, etc. Naturally such great variations in the fields brought with them variations in the quality of the harvested products. The different types showed great variations in regard to chemical composition. Both protein and starch content varied and both protein quality and starch quality differed considerably as between the many types in the stand.

Since new varieties have been put on the market as a result of the activities of the plant-breeders, there has at least been a change in the old practice in certain parts of the world. The greatly improved yields which can be obtained have been commented upon above, but the nutritional quality of the grain may also be improved. As examples of the successful work of the plant-breeders in this respect, should be mentioned the new types of high-lysine maize, Opaque 2 and Floury, discovered at Purdue University at La Fayette, Indiana. In Opaque 2, the lysine content is increased from 3 to 4.8% and that of tryptophan from 0.7 to 1.3%. With respect to barley, the new high-lysine types from the Swedish Seed Association at Svalöv seem to show considerable promise for the future.[6]

When new breeds are introduced, due consideration must be given to sociocultural attitudes. For example, it is not easy to introduce a wheat variety with red kernels in an area where the local people are used to wheat with white kernels. The new red variety may, from a nutritional point of view, be better than the old white one, but the local people do not know this and are not willing to accept it. The traditional way of thinking counts more. Not until there is a better educational system will it be possible to argue in favour of the greater nutritional value of a variety that appears different from the old ones.

Nutrition and future planning

It is evident from the statements above that, as a part of the agricultural production, the nutritional aspects have not been very much considered. The reasons are quite evident. It has not been clearly enough shown by experiments nor strongly enough emphasized in advisory work that the nutritional character of agricultural products may be the result of the cultivation technique on the farms. Nor have enough efforts been made to fix prices for farm products that would inspire the farmers to go in for the kind of production in which a high quantity per

hectare is combined with a quality that takes into account not only the technological characters but also the nutritional ones.

Against this background, it seems logical to start the planning for better production from a nutritional point of view with price-fixing that favours products with high nutritional values. It seems logical to proceed along these lines in a period when such great efforts are being made to obtain and introduce improved varieties and new production technology. Such a development, however, calls for experimental work in the field and in the laboratories which makes it possible to judge, under various environmental conditions, how the characters of the crops and of the harvested products should be evaluated. Some views in regard to various crops and products, based on the type of production and marketing activities that has been indicated above will be discussed in relation to the following groups, namely, (1) cereals, (2) other crops, among which leguminous plants and other protein crops are especially important, and (3) various animal products.

Planning for cereal production. The planning of better cereal production in developing countries must be concerned, first of all, with higher quantities per hectare, in order to get a sufficient food supply for domestic use and possibly also for export. An increased yield per hectare is obtained from better and more evenly developed kernels. These kernels have at the same time, on an average, a better chemical composition than the uneven and often diseased kernels from poor stands.

Behind the requirements regarding evenness of size and development lie requirements regarding the choice of varieties and methods of cultivation. The farmer must be aware of the existing differences in varieties and choose those that suit his local conditions.

The importance of methods of cultivation has to do with the possibilities of influencing the type of stand obtained. The sowing methods, the use of fertilizers and the use of chemicals and other means of controlling weeds, diseases and insects all influence the evenness and development of the stand. Such methods of harvesting and threshing must be applied in order to preserve the quality obtained in the field or improve it.

How and to what extent can the requirements for quality production be met in the developing countries? The first step in the planning, especially for improved nutritional quality, is to use new varieties,

which either originate from international research institutes or from activities encouraged by the FAO or are the results of local breeding. The varieties produced by local breeding should by no means be overlooked, even though the material from the international organizations generally has a better scientific background and has been more effectively studied in regard to special characters than the material from local breeding stations.

The problem of getting new material into use with the individual farmer is a problem of information and advice. To the necessity of using new varieties in order to get a better product should be added the need for using the right seed of these varieties, which calls for a seed-certification system that guarantees that the varieties used are not mixed with other varieties. Unfortunately, seed-certification systems are poor in the developing countries. They must be improved, in order to make possible the efficient use of the new varieties appearing on the market.

The second step is the adoption of improved agricultural practices. In principle, this embraces the same problems as the application of modern cultivation technique in the developed countries. Still, in practice the differences are great. Improvements that are of a fairly simple nature and are in fact quite easy to carry out will mean great changes in the present situation in the developing countries. The areas within which they fall are (1) methods of sowing, (2) use of fertilizers, (3) use of chemicals or other means of controlling weeds, diseases and insects, (4) efficient harvesting and threshing methods, and (5) food preservation. In regard to sowing methods, it is certain that measures like a better-prepared seed-bed, sowing by machine instead of broadcasting, and choosing a better sowing time in relation to wet and dry spells during the vegetation period can yield enormous results. As regards fertilizers, the use of phosphorus and nitrogen in only moderate amounts would be of great help and, as regards controlling weeds, cleaning by the use of manual labour would be a considerable step forward. Occasionally, chemicals may be of value for weed control and quite often they should be used against insects and diseases on the cultivated plants. The harvesting, threshing and storage methods used today are such that a considerable proportion of the products obtained in the field is lost or spoiled before it gets to the consumer.

The factors chosen as examples of how to improve cereal production

have an influence not only on yield but also on the chemical composition of the kernels. The relation between the starch and the protein contents is then of special interest, but the quality of each of these two components of the seed must also be considered. Activities aimed at these goals call for the training of the farmers, in order to make them understand the value of the qualitative factors. They also call for the fixing of prices for cereals of good quality that give the farmers an economic advantage.

Thus, to sum up, as regards the cereals—wheat and barley as well as rice, maize and sorghum—the very fine developments which we have witnessed in recent years should be followed up and the practical application of these developments should be directed towards a higher production of cereals with better quality.

Planning for the production of other seed crops. Some people may insist that protein from cereals is the way to meet the protein crisis in the world. Others may argue that, even if more cereal proteins become available and even if they are of other types than the present ones, there will still be a need for vegetable proteins from other sources, mainly pulses and oil-seeds.[1] Proteins from these crops will have compositions different from those of the various cereal proteins and will undoubtedly be good supplements in the drive for satisfactory food products and feeding stuffs. To this should be added that, for efficient crop production, there is a need for a crop rotation in which pulses and oil-seeds, in alternation with cereals, play an important role. Thus, there are many reasons to argue in favour of pulses and oil-seeds as important components in an agricultural planning that considers both the production side and the nutritional aspects.

So far, there have not been the same activities in the development of new plant material of pulses and oil-seeds as there have been in that of various cereals. It is true that efforts have been made both in Africa and in South-East Asia to improve the plant material of pulses and oil-seed crops. But to a very great extent the developing world at present looks for soybean and groundnut material from the U.S.A., for sunflower material from the Soviet Union and for mustard and rape material from Canada and Sweden.

The most plausible explanation of this situation is that cereals are

more easily grown and have so far given more reliable yields than pulses and oil-seed crops. Also the lack of attention to the nutritional superiority of pulses and oil-seed crops, in comparison with cereals, has prevented the development of the former as important food crops in the developing countries. Now pulses and oil-seed crops are gradually coming more to the fore as plants of essential interest, both on the nutritional side and on the production side. There is an urgent need for international institutes, organized in a similar way to the IRRI and the CIMMYT, to inspire future activities in bringing forth new plant material, developing better cultural practices and increasing advisory work for the cultivation of pulses and oil-seed crops. When this has been achieved, such production results can be expected as will stimulate an interest in fixing prices that will inspire farmers to grow more pulses and oil-seeds.

Planning for improved animal products. The importance of animal production for a satisfactory nutritional level of food production in general has been discussed above. I then pointed to the great need for breeding animals with greater abilities to produce milk and meat under tropical and sub-tropical conditions. I also pointed out that, for the improvement of milk and meat production, the supply of fodder from the pastures and leys is of paramount importance. For the world food situation, an improvement of the cattle fodder is as essential as the improvements that were discussed in connection with cereals, pulses and oil-seeds intended for direct consumption by human beings.

The number of cattle in the world is immense. For the sake of nutrition, both the cattle and the grasslands must be used much more efficiently than is the case today. The international institutes in Nigeria and Colombia may help us to develop this important field, as will also the national insemination projects in Kenya, Ethiopia and other African countries. It seems, however, that in all these cases the efforts to improve the cattle are getting more attention than the efforts to improve the feed situation. Much more work is needed to secure fodder from pastures and the natural grasslands. Techniques whereby grasses and legumes in the grasslands or other crops from supplementary fields for the production of feeding stuffs can be transformed into feed for the cattle during periods when grazing does not give them enough are urgently needed. Here is a combined task for agricultural scientists and industrial firms.

The "green revolution"

Reference has already been repeatedly made to new high-yielding varieties of cereals (maize, wheat, rice, etc.). Indeed, the results of their widespread cultivation, so far practised especially in South-East Asia and Central America, have been highly spectacular. Countries like India and Pakistan, which only a decade ago were to a considerable extent dependent on imports of rice, today produce more than their own needs. The term "green revolution" has been coined and is well justified. If a similar development can be foreseen in the near future also for other crops, for example, pulses and oil-seeds, even more dramatic results may be expected.[2, 3, 4]

Different phases have been delineated in the "green revolution". The *first phase* concerns the development at agricultural research centres of new breeds providing higher yields, greater stiffness of straw, more efficient reaction to fertilizers, improved resistance to plant diseases and insect attacks, and eventually better quality of the harvested product.

The *second phase* includes studies of cultivation techniques, making it possible to utilize the new varieties. It also includes advising people about the best use of the new varieties under varying growing conditions and it should include information campaigns, in order to build up an understanding of the value of the new varieties and the fixing of prices that favour their use.

The *third phase* involves action in getting the new material and the methods for its growing adapted to and used on farms of different sizes and with different economic and technical possibilities. This phase may prove to be a crucial one. There is a growing uneasiness that the economic benefits of the "green revolution" will reach the big landowners rather than the small peasant farmers and thus widen the gap of social injustice rather than bridge it. This problem must be tackled energetically and without delay, lest the "green revolution" should foster the seeds of a "red revolution".

Some planners see in the recent breakthrough in high-yielding crops *the* solution of the problem of meeting the food needs of the fast-growing world population. A more cautious evaluation seems preferable. The "green revolution" has created a desperately needed breathing spell. This must be used energetically for the parallel application of large-scale

family-planning measures. If not, we shall only see the inevitable global under-nutrition postponed for a couple of decades at the most.

Conclusions

1. Nutritional goals should be allowed to have a major influence on agricultural planning.
2. More than previously, agricultural planning must consider the quality aspects, this term being used in its widest sense, including the nutritional value of agricultural products.
3. An improved dietary standard with respect to proteins, fats and other nutrients can be achieved by favouring the balanced cultivation of traditional crops and the increased use of animal products. In recent times, new avenues have been opened by the introduction into crop production of new, high-yielding, cereal varieties and new cultivation techniques (the "green revolution").
4. The "green revolution" has already proved its enormous potentialities as far as crop production is concerned. The effects of this development must, however, be viewed in its total setting. Precautions must be taken that the socio-economic benefits are not limited to the wealthy but reach those in most need.
5. Further work in international agricultural research should be aimed at improving also the leguminous crops with respect to both yields and nutritional value.
6. Better training in human nutrition for people engaged in agriculture is a necessity within the curricula of the agro-based sciences. Courses in human nutrition should be part of the overall planning for combined activities in the fields of nutrition and agricultural planning.
7. In order to encourage development along the lines mentioned above, governments must work out marketing systems and price-fixing which favour both quantity and quality in the production of foods.

References

1. Åberg, E.: Oil-seed Production in West Pakistan. Background, Plan of Operation and Future Activities. Report on a Technical Mission, March–June 1971. Department of Plant Husbandry, Agricultural College of Sweden, S-750 07 Uppsala 7, 1971. Duplicated.

2. Aresvik, O.: Planning for the Green Revolution in Africa. The Arid Lands Agricultural Development Program, Middle East Area Office, The Ford Foundation, August 1971. Duplicated.
3. Borlaug, N.: *Wheat Breeding and its Impact on the World Food Supply*. Canberra, 1968.
4. Brown, L. R.: *Seeds of Change*. Praeger, New York, 1970.
5. FAO *Manual on Food and Nutrition Policy*. Rome, 1969.
6. Hagberg, A., Karlsson, K. E., and Munck, L.: Use of Hiproly in Barley Breeding. Improving Plant Protein by Nuclear Techniques. International Atomic Energy Agency, Vienna 1970.
7. Rattray, J. M.: *The Grass Cover of Africa*. FAO, Rome 1960.

Nutrition in Relation to Food Science and the Food Industries

By FRANCIS AYLWARD*

Some types of food industries are well represented in developing countries, for example, units for the production of flour, bread, oil, sugar, salt, beverages, etc. There is a great need, however, for the more systematic application of food science and technology, both on the village level and for further development on the industrial level. The food industry may assist in improving nutrition by making more and better food available in greater variety and at a cheaper price. This is an especial need of the fast-growing urban populations.

The term "food industry", as used in northern Europe or North America, often implies a large-scale manufacturing enterprise. In this paper the term will be used to cover units concerned with food storage, preservation, processing and distribution of any size and without regard to ownership or control. This may be vested in a family or other private group, in a small or large limited-liability company in a village co-operative or in a state enterprise.

The growth of large enterprises in the food industries has come about in northern Europe only in the past few decades. The earlier types of units were usually confined to a single commodity (for example, a bakery) or a single process (for example, a bottling plant or cannery). Growth has taken place in the size of the commodity or processing units and more recently enterprises have been built up—often by mergers—to cover a wide range of raw materials and different types of

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end-products. It is important to realise, however, that in many parts of Europe the small enterprise is still of importance; they are normal in southern Europe and still flourish in many northern countries. For hundreds of years, European countries have depended on food firms of family size; the more recent changes have come about in part because of scientific and technical innovation but even more so because of the cost of labour and its availability.

In African countries the relative advantages and disadvantages of small-scale, labour-intensive versus large-scale, capital-intensive industries must be examined carefully, taking into account all the relevant factors in the local situation. I believe that this analysis is particularly necessary in relation to food preservation and processing and that in many parts of Africa the small- and medium-scale enterprises may have many advantages, especially in relation to foods for local consumption, as distinct from products for export and sale in foreign markets. In many areas the prudent policy will be to encourage enterprises already in existence and to see what help can be given—in particular by training men and women to assist in development plans.

The food industries are concerned with the utilisation and transformation of the products of agronomy, animal production and fisheries, and must be regarded as an essential link between the primary producer and the ultimate consumer. In Europe the links between the food-manufacturing industries and the farmer often take the form of seasonal or long-term contracts, but co-operatives in some countries play an important role.

The manufacturing industries may be linked also with distributing enterprises; the super-market is now an important part of the food chain, as indeed are local markets which exist in both urban and rural communities on all continents. Food-processing enterprises are often linked also with catering organisations, both with ordinary "open" catering in restaurants and with catering for special or "closed" groups through canteens in offices, factories, schools, hospitals and other institutions. Questions of food distribution and food service are becoming of importance in most parts of Africa because of the rapid growth of the capitals and other cities. Unless precautions are taken, the urban populations, in spite of the higher wages paid in a cash economy, may find themselves in a worse position nutritionally than their kinsmen in a rural society.

The contribution of the food industries

The contribution of the food industries to the national economy and to nutritional improvement may be analysed under six headings:

(i) *Food conservation;* avoidance of waste; avoidance of seasonal shortages.

(ii) Improved *distribution,* especially important for *urban* communities.

(iii) Increased *variety* of food.

(iv) Provision of *new products*—with more effective use of agricultural raw materials.

(v) Production of *dietetic foods,* including infant and weaning foods.

(vi) General *social* and *economic* effects.

Food conservation. Under this general term we may consider (*a*) the short-term storage of grain and other staple foods and (*b*) the longer-term storage of commodities by techniques such as dehydration, heat treatment, bottling or canning, and refrigeration. The objective of conservation is, in the first instance, the avoidance of waste; many types of foodstuffs deteriorate rapidly unless they are subjected to some form of treatment. This deterioration is particularly rapid in a tropical country, where so many factors conspire together to hasten the process—high temperatures, humidity, and the abundance of insects and other pests.[3, 4]

Up to very recently, governments and international bodies were reluctant to talk about waste—with its implications of poor "housekeeping"—but the *War on Waste* is now accepted as one of the five "areas of concentration" in the FAO programme and by the member governments of the FAO. It is now possible to state publicly and without giving offence that there is little point in a country embarking on elaborate programmes for increased agricultural production unless there is a corresponding programme for the post-harvest treatment of the products of agriculture.

A second important aspect of conservation is in the economic sphere; to provide some form of "buffer" to deal with surpluses and to reduce price fluctuations. This is an essential part of a programme to persuade the farmer to produce more of a given commodity, whether from animals or crops.

A third aspect is the elimination of the "hungry seasons" in the

weeks and months before the new harvest. This period of food deprivation has been a characteristic of life in many parts of rural Africa and has reached serious proportions in many countries at frequent, even if not always annual intervals. Such "hungry seasons" were at one time well known in European countries, as may be seen from accounts given in *The Englishman's Food* and other books on the history of food. In the extreme form, these hungry seasons reached famine proportions and some of the earliest recorded interventions of government in respect to food supplies are given in the biblical account of the granaries of the Pharaohs, established to protect the people against the "lean years" with poor harvests.[3, 4, 10]

In descriptions of the modern food industries, authors usually stress (i) that the modern large-scale factory cannot produce high-quality foods on the basis of poor quality and irregular surpluses from the farm and (ii) that for success the farmer should produce crops and animals with the characteristics required for processing. These statements are true and must be borne in mind in any proposals in Africa and elsewhere to establish large-scale enterprises as the basis for an export trade. However, in considering food industries for home consumption, the long-term concept of the improvement of crops for processing need in no way conflict with immediate plans to make the fullest use of existing knowledge and techniques to conserve crops of the types now being grown and to ensure the fullest utilisation of animal supplies also.[5,7]

Improved distribution. In a rural community, food supplies come usually from the immediate locality. This was the normal pattern in Europe until the opening up of the railways and steamship routes 100 years ago. It is the pattern in many parts of Africa today. Reference is often made in publications on Africa to the movement of cattle on the hoof, for example, from Mali to the coastal areas of Nigeria and Ghana. English history records that a similar movement of cattle was normal until comparatively recent times. And not only cattle—the turkeys for the Christmas festivities walked 100 miles to London from the eastern counties. Better communications may be of little use in the movement of food unless techniques are available to conserve food en route to the point of consumption. In Europe, major changes in respect of meat came about with the combination of railways and refrigeration;

this was followed at sea by refrigerated cargo vessels and on land by refrigerated motor transport.[6]

Although rural communities may—under normal circumstances—survive with the minimum movement of foodstuffs, this cannot be true of the townsman, who is usually unable to grow his own crops and is dependent on others for his supplies. The food and nutrition aspects of urbanisation were discussed at a symposium of the (British) Nutrition Society in 1969 and have received attention at other conferences also. The growth of the capitals and other cities in Africa has taken place over the past 20 years, at a rate almost unprecedented in the history of other continents, and this rapid urban growth may well produce nutritional and other health problems more serious than those which occur in many rural communities.[4, 5]

Once it becomes impossible to provide the major food supplies for towns from the surrounding countryside, then the food-preservation and food-processing industries become an essential part of the infrastructure required for urban living. If this fact is ignored by many who prepare national development plans, it is no doubt because food supplies are often taken for granted in European countries, except in time of war or natural catastrophes. Food enterprises have grown up gradually over the centuries in Europe and other continents to meet the demands of urban communities. Private initiative has usually been able to keep pace with the changes, except in certain areas, such as food supplies for schools and hospitals. In the more rapidly evolving African situation, special efforts are required to provide a stimulus for food preservation, distribution and catering enterprises.

Increased variety. In Europe and North America there are frequent public complaints about the increasing degree of *standardisation* of mass-produced food. Some of the complaints are no doubt justified and many food enterprises are endeavouring to counteract them. But comments on standardisation and uniformity should not blind us to the enormous increase in the range of foodstuffs now available in the typical European town. Admittedly, this is a reflection of economic prosperity, but the variety would be impossible without the advances in science and technology which have been applied so successfully in many countries to the transport and preservation of foodstuffs. It is no longer necessary

for man to be dependent on seasonable supplies and to be subjected to the hazards of seasonal shortages.

From the nutritional standpoint, variety in foods has many potential advantages, more especially if programmes of nutrition education can be stressed to encourage the consumer to broaden his choice in the right directions. In African terms, economic problems may limit the variety that can come from imports from outside the continent, but within many regions of Africa there is scope, using the newer methods of processing, for broadening the basis of the diet with commodities which are already being produced or which can be readily produced within a region.

Effective use of agricultural produce. Many products of agronomy cannot be *directly* used by man without some preliminary processing, carried out in the house or elsewhere. The wheat grain has first to be milled, then the flour has to be transformed into bread or other products; other cereals, such as maize, must also be subjected to a milling process. Some crops require special treatment to remove or destroy anti-nutrients or poisonous constituents; thus cassava (manioc) must be grated and exposed to air to liberate and break down the cyanophoric glycosides which can cause illness and, in extreme cases, death. Leguminous crops, which grow by making use of atmospheric nitrogen, are important sources of protein and are widely used both by man and by domesticated animals. Many different types of legumes grow readily in Africa, but the majority contain anti-nutrients to a greater or lesser extent. Some of these can be destroyed by ordinary domestic cooking processes, others require special treatment.[2]

Apart from the toxic factors which may be inherent in the crop, other toxic factors may arise during storage. The aflatoxin story in respect of groundnuts (peanuts) and other commodities is well known; the full utilisation of groundnuts in Africa will depend on the scientific and technical control of harvesting and post-harvest storage and processing. Some crops of nutritional value can be eaten in the unprocessed form in limited quantities only because of their content of fibre or other indigestible components. Groundnuts are in this category. Other crops may yield products which have flavours or colours which are not acceptable in a local community.

Much of the recent work on protein foods has had for its objective the preparation from plant material of concentrates of flours which are

high in protein content but are free from anti-nutrients and low in fibre. Many different sources are used—oil-seeds, such as soya, groundnut, cotton-seed, rape or sesame, and other crops, such as beans. The most significant impact in North America has come from soya products; this is in part a reflection of the importance of the soya crop in the US economy and the heavy financial investment in research and development work designed to make the fullest use of this crop. There is no reason why, given the appropriate research effort, different countries in Africa, as well as in other continents, should not be able to produce protein concentrates derived in large part from their indigenous agricultural produce.[1, 11] Thus, in Britain one important food enterprise is making use of the broad bean.

In examining the protein sources to be used as the basis of the new technology, we should not ignore chlorophyll-containing material, produced in such large quantities in Africa and indeed in all regions of the world. For reasons which are far from clear, there have been controversies over the potentialities of protein production from leaves and other chlorophyll-containing material. Recent reports from the United States Western Regional Laboratories in California deserve the attention of all who are interested in this problem. It is claimed that a process has been worked out, and is now operating on an industrial scale, for the fractionation of alfalfa (lucerne) to give a high-fibre product suitable for ruminants and a low-fibre, high-protein product suitable for monogastric animals. This latter product is regarded as a potential raw material for protein for human use.[12]

The newer food-processing technologies have been applied not only to agriculture but also to marine crops to obtain protein concentrates from fish and in particular from produce that would not be directly acceptable. In a different category are the many projects which have been established on a commercial basis for the utilisation as protein sources of the products of microbiological fermentation and related factory processes largely divorced from agriculture.

In any discussion of new products, both the economist and the nutritionist can learn from a study of the history of the margarine industry, established just over a century ago. Margarine may be regarded as the prototype *substitute* food. The earlier products were undoubtedly inferior to butter, in respect of both consumer preference and nutritional value, but from 1925 onwards full use was made of

nutritional knowledge; this led first to fortification by vitamins and later to control of the quantities of poly-unsaturated fatty acids. The margarine story is of special interest to Africa, because the growth of the industry in Europe stimulated demands for tropical oil-seeds and has prepared the way for the establishment in Africa of local industries based on oil-seed extraction.

Dietetic foods. The food industries in Europe and North America have throughout the present century been responsible for the preparation and marketing of a variety of special products of dietetic value, including milk products and milk substitutes for babies and weaning foods of many types. The processes have depended on the careful choice of raw materials, compounding based on nutritional principles and fortification with vitamins and minerals, with careful control of hygiene at all stages.

The application of these techniques and the use of new products in Africa will be discussed in other papers in this book and need not be considered further here, but it should be noted that for economic reasons new products will almost certainly have to be manufactured from raw materials which are available (or potentially available) in Africa.

Social and economic considerations. In an African agricultural community, much time and energy is expended (particularly by the women) on processes (such as the milling of grain) that can be readily carried out on a village or regional basis, using suitable machinery. In Europe, milling was one of the first industries to be separated from the farm; primitive wind- and water-mills were the prototypes of the highly organised flour mills to be seen in our European ports and other cities. The "hiving-off" of cereal-milling and other activities has already taken place in various parts of Africa and much has been achieved by the introduction of small-scale power mills. Such changes can produce important effects in social life.[3, 5, 9]

The general economic effects of the food industries cannot be discussed in detail here. They include (i) a stimulus to the farm to produce more crops, (ii) the substitution of imports by home-produced foodstuffs and (in some cases) (iii) the possibility of establishing an export trade in foodstuffs. All three aspects are important in a national

economy and may have effects for good on the food supplies and on the nutritive status of the population.

Reference has already been made to the importance of decisions on the *scale* of operations. One great potential contribution of the small- or medium-scale industries is their contribution to *local* employment in an agricultural community, in contrast to the migration of labour that is almost always a consequence of the establishment of large-scale factories. In practice, the balance between different concepts and different objectives may well change with time.

Nutritional control

It is impossible to give here a detailed account of the storage, preservation and other techniques used in the food industries for different types of commodities. The choice of techniques should be made in the light of economic and nutritional, as well as technical considerations.

Refrigeration is a preservation method of great importance in all countries, and not least in the tropics. Yet the growth of the frozen-food industries in Europe has up to recently lagged behind that of the United States, because economic conditions in many parts of Europe did not favour the purchase of domestic refrigerators. There are today in the various countries in Europe wide differences in the percentage of families owning refrigerators. Refrigeration therefore—at any rate on a domestic scale—will have to follow in Africa the course of general economic advance, and will depend on the more general distribution of cheap power, although much more can no doubt be done now through central and community installations. The use of simple cold-storage cabinets, now common for the storage and sale of soft drinks in parts of Africa, illustrates what can be done on a village scale where the targets have been defined.

Canning is one of the most reliable, and in Europe one of the cheapest methods of preservation for fruits, vegetables and other commodities, but there have been a number of failures in canning enterprises in Africa. Planners have often forgotten that cans (or imported tin plate) may be a drain on foreign exchange and the cost of tin plate may place canned goods beyond the reach of the poor sections of the population. It should be noted that the older methods of heat treatment through bottling are still widely used in Europe. Bottle-making plants

can be readily set up; in fact they exist in many parts of Africa as adjuncts to breweries. Sterilization processes, using newer synthetic materials, will be of great importance in Africa.

Dehydrated foods, produced by drying the material in the sun or in hot air, sometimes in conjunction with smoking, are well established in some parts of Africa and there is little doubt of the economic advantages of dehydration in terms of long-term stability and of the relative simplicity of the flexible containers required. There is scope for more active research and development work on simple and effective dehydration techniques which could form the basis for the extension of village processing industries. There is room also for improvements in other traditional methods of preservation, including those based on pickling and fermentation. Some of these techniques may be well established in one area but unknown elsewhere.

In this paper I have stressed the potential contribution of the food industries to economic life; the contribution to nutrition should come in part from making *more* foods available and in greater *variety* and at a *cheaper* price and in part from the production of foodstuffs required for special groups. The great achievement of the food industries in Europe is that they have, on the whole, been successful in maintaining supplies to large and growing populations concentrated for the most part in urban conglomerates.

It would be false to claim that the food industries in Europe have in the past had nutrition as their primary and declared objective; there have in fact been many controversies in which nutritional scientists and public-health workers have opposed the actions of sections of the food industries and the views of scientists working in these industries. At different times, bread, milk, margarine, canned products and other commodities have been the subjects of debate.

In more recent years, attitudes have changed and most of the major firms in the food industries in Europe have been ready to recognise their nutritional responsibilities and to accept, when necessary, a degree of nutritional, as well as microbiological control. In defence of the food industries, it may be said that various processes (for example, methods of wheat-milling, techniques of margarine manufacture and milk condensation) were established in the last century before the nutritional role of vitamins, trace elements, lipids and proteins was established. Thus, to take an example, there were no methods available to determine

in detail the effects of new milling techniques on the nutritional value of flour and bread.

Much has been achieved in recent years through co-operation between the nutritional scientists and the food industries and through legislation in respect of food standards, food fortification and food additives and contaminants. It is clearly important in Africa that the emerging food industries should recognise their nutritional responsibilities and that there should be appropriate legislation for consumer protection. This matter is one of urgency in some regions, where changes in dietary habits and the allocation of high proportions of income to new foods of poor nutritional value will lead to a shift for the worse in an already unstable nutritional equilibrium.[3, 4]

Education and training; research and development

The growth of food storage, preservation, processing and distribution depends on trained personnel at different educational levels from craftsman and technician to university graduates and post-graduate research workers. There is a parallel need for the establishment (and staffing) of laboratories and other centres for research and development and for food control. In comparatively few countries in Africa are the trained men (or women) available; in very few countries are there effective centres for food, as distinct from agricultural, research.[8, 9]

Technical training. At the technician's level, the food industries have usually been ignored, but there should be no great difficulty in establishing technician courses in departments of food-processing attached to certain technical colleges or schools or to (sub-university) schools of agriculture. In a few cases, it may be possible to have organised food-processing instruction through a widening of the activities of some of the dairy training centres already established in different parts of Africa.

University departments. At university level there is need for a limited number of African universities to establish departments of food science (or preferably food and nutrition science) to provide courses in preparation for posts in the food industries, food research, food control and educational, extension or advisory work. Such departments will probably be most effective if they are in universities which already have faculties

of agriculture and (ideally) also faculties of medicine, so that there can be the maximum co-operation in respect of food and nutrition problems.

The establishment of a food department in a university cannot be undertaken lightly. Because of the wide range of subjects that come within the scope of food science and the complexity of food industrial operations from farm to consumer, a department will require a minimum teaching staff of at least six, of whom at least one should have had formal training in the biochemical and physiological aspects of nutrition and a second should be familiar with local agricultural potentialities. It is essential that a department should have adequate laboratory facilities (for example, for food analysis, applied biochemistry and microbiology) and also pilot-plant facilities and that a departmental library should be established.

A food department should be able to carry out research, both in co-operation with other departments (for example, those concerned with agricultural production) and with groups outside the university.

Food-science departments have (with few exceptions) been omitted in the past from university development plans in Africa, largely because such departments did not exist in Britain and other European countries up to comparatively recent times. There is now a body of experience in Europe and elsewhere which can be made available to African countries in relation to food science. Various centres, including that at Reading, are now providing facilities for the training of lecturers and research workers to staff the new departments now being created.

Research and development centres. All European countries have research and development centres designed to carry out investigations on local raw materials, processes and products. Very few such centres exist in Africa, in spite of the very considerable investment in agricultural-research institutes. It is unfortunate that in many areas the older European tradition has been followed, whereby agriculture stops at the farm gate.[3, 9]

A food research and development centre in an African country must clearly have close links with agriculture, but it has to deal with problems quite different in character from agricultural production. For success, a food centre requires a director and staff who have had practical experience in food preservation and processing and who are prepared to

give priority to *applied* problems and to information and advisory services.

Conclusions

In the earlier sections of this paper, I dealt with the potential contribution of the food industries to nutritional problems. In the latter section I have covered briefly the requirements in terms of men and institutions. These requirements can be summarised as follows:

(i) Centres for the training of technicians at the sub-university level.

(ii) Centres for food and nutrition science at the university level.

(iii) Centres for applied research and development with associated advisory services.

(iv) Interim facilities for the training of personnel abroad.

Much remains to be done in many parts of Africa in respect of (i), (ii) and (iii). The barriers lie not so much in finance but in the priorities accorded by national governments in their national development plans and in their approaches to the UN and national aid agencies or international foundations.

The relatively slow rate of progress is the result of many factors. Often the difficulties associated with food preservation and processing have been underestimated by advisers who are not familiar with the subject. Food problems tend to fall between agriculture, chemistry, and engineering and (in respect of nutrition) medicine and public health. This may be true in universities, in national research councils and in government departments. The most important requirement is the training of local people who can staff teaching and research centres and can act as advisers to their own governments.

References

1. Altschul, A. M.: *Processed Plant Protein Foodstuffs.* Academic Press, New York, 1958.
2. Aykroyd, W. R., and Doughty, J.: *Legumes in Human Nutrition.* Nutritional Study No. 19. FAO, Rome, 1966.
3. Aylward, F.: A Report to the Government of Ghana on Foods and Nutrition. E.P.T.A. 1449, FAO, Rome, 1961.
4. Aylward, F.: Some African Problems. *Proc. Nutr. Sci.* 1961: 20, 112.

5. Aylward, F.: Food Habits in Western Tropical Africa. *Chem. & Ind.* 1966: 1624.
6. Aylward, F.: Food Supplies for Urban Populations in Developing Countries. *Proc. Nutr. Soc.* 1970: 29, 169.
7. Aylward, F.: The Food-Agriculture Complex in Developing Countries. *World Crops,* 1970: 22, 74, 148.
8. Aylward, F.: Food Science & Technology in Europe, Canada and Africa in Proc. Int. Congr. Food Science & Technology (Washington, 1970). Inst. of Food Techn. Chicago, 1971.
9. Aylward, F.: Food Conservation and Utilisation in Developing Countries. In *Progress in Nutrition.* (Ed. Margen, S.) Avi Publ. Co. Hartford, 1971.
10. Hollingsworth, D. F. (Ed.): Drummond's & Wilbraham's *The Englishman's Food* (2nd ed.) Jonathan Cape, London, 1958.
11. Milner, M. (Ed.): *Protein Enriched Cereal Foods for World Needs.* Am. Assoc. Cereal Chem. St. Paul, Minn., 1969.
12. Pirie, N. W.: Leaf Protein. Proc. Cimbatore 1970 Symposium, Blackwell, Oxford, 1971.

PLATE I (*a*). A child with severe marasmus. Note extreme wasting of muscles and subcutaneous fat but no apathy. Photograph: Y. Hofvander.

(*b*). A child with typical kwashiorkor. Note apathy, swelling on feet and legs, and skin affection. Many of the children wear charms "for protection". Photograph: Y. Hofvander.

PLATE II. A child suffering from moderate protein–calorie malnutrition. Note the "tired" position, due to the muscles being wasted for lack of protein. Photograph: Y. Hofvander.

PLATE III (*opposite*).

(*a*). *Above:* A local rice variety with weak straw (to the left) and a bred variety with a better straw strength (to the right). In the background bred varieties with good straw strength. The Philippines 1971. Photograph: Ewert Åberg.

(*b*). *Below:* Facilities for grain storage. Kenya. Photograph: FAO.

PLATE IV (*a*). Soya beans at a high altitude. Ethiopia 1969. Photograph: Ewert Åberg.

(*b*). Cattle grazing in a scrubby area in Kenya. Quite a common sight! Photograph: FAO.

PLATE V (*a*). Pot luck for a hungry youngster in Africa. Maize porridge and a relish from pumpkin or cassava leaves is a diet too many are trying to thrive on. (*b*). In many African countries it is the custom to put on the grave a possession which the deceased was very fond of. It is heartbreaking to see so many graves with feeding bottles—beloved by the baby, but also the actual killer!
Photographs: National Food and Nutrition Commission, Lusaka, Zambia.

PLATE VI. Efficient coordination of the various educational aids is important in any nutrition-education campaign. When school broadcasting is coordinated with distribution of visual aids to the teacher and the teacher really applies them, there is a better chance that the nutrition message will be understood and remembered.

Photographs: PLATES VI and VII, National Food and Nutrition Commission, Lusaka, Zambia.

PLATE VII (*a*). Africa learns orally. The villager is a good listener. Radio is probably the most powerful means of communication in rural areas—and must be part of any nutrition-information campaign. Women's nutrition clubs or listener groups with somebody to lead discussions on the topic of the broadcasts greatly increase the impact. Listener groups can also supply systematic feed-back to the programme producer!

(*b*). Voluntary work sponsored by the FFHC or other bodies is a method which can be applied successfully as part of a nutrition-information campaign. Voluntary nutrition groups in Zambia are selling protein-rich foods through more than 400 depots on a non-profit-making basis and, most important, they are using the sale as an opportunity for teaching about better nutrition.

PLATE VIII. "Modern Bread" was India's first venture in the fortification of cereal foods. It dramatized the possibilities in this field and has in turn led to other projects reaching successively larger groups of consumers. Photograph: Inder Nakra.

PLATE IX (*opposite*). Mother-and-child health services are important weapons in the combat against disease. They require little equipment and can be carried on in a loaned house or under a tree or simple shelter. Photograph: A. Riwkin.

PLATE X. The role of the open-air markets in Africa is just as important to-day as it was for earlier generations. The markets provide a great variety of goods, usually displayed in a very clearly arranged way. At the same time the markets form an ideal centre for the communication of information, old and new. Photograph: A. Riwkin.

PLATE XI (*opposite*). These two children both look chubby and well-fed. However, the light-coloured hair and the big abdomen of the child to the right indicate a past history of protein–calorie malnutrition. This has also left its mark in his stunted growth, i.e., suboptimal height. Photograph: Tiofoto.

PLATE XII. For the overwhelming majority of families in pre-industrial countries, breast feeding means literally life or death for the baby during the first 6 months of life and is of enormous importance also for a long period thereafter. Photograph: FAO.

The Marketing of Protein-Rich Foods to Vulnerable Groups

By BO WICKSTRÖM*

Young children's need of high-quality, protein-rich food has led to the launching in a number of developing countries of programmes for the domestic production of such "weaning foods". Under the prevailing conditions, marketing offers a number of problems; however, the general principles laid down in the industrial countries are still valid. Critical evaluation of the results of marketing procedures is of basic importance.

Animal milk has long been considered the best supplementary food for preventing and treating protein–calorie malnutrition in children. Since animal milk is scarce in most developing countries, the UNICEF started at an early date to donate skim-milk powder for distribution to children and pregnant and nursing women. The supplies were, however, neither unlimited nor constant. Attempts have therefore been made to develop vegetable-protein foods as substitutes for milk. It has been shown from experience in Guatemala, India and Uganda, for example, that mixtures based on cereals, grain legumes and low-fat oilseed flour can be used for the prevention and treatment of protein–calorie malnutrition. The pioneer initiative was taken by the Institute of Nutrition for Central America and Panama (INCAP) in Guatemala, which developed a mixture based on maize and cottonseed flour called "Incaparina". Through co-operation between the WHO, the UNICEF and the FAO, the development of new protein-rich foods has been stimulated. Today we have a large assortment of commercial or semi-commercial, protein-rich foods, developed during the last 10–15 years and directed primarily to the lower income groups. Few of these have achieved any significant distribution, however; two or three thousand tons of product distributed would be considered a good figure in this context. Only

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when the product is distributed free of charge through an institutional system of distribution, as in the case of the CSM mixture (corn, soy and milk powder) does the volume reach significant proportions. The CSM mixture, which was developed and donated by the US, has so far been produced in a volume of 250,000 tons and been distributed by the US AID through voluntary agencies in over 90 developing countries.

The mixtures are usually based upon cereals, legumes, de-fatted oil-seed (flours and concentrates), skim-milk powder, vitamins, minerals, sugar, and salt in various combinations and have a protein content of 20–30%. "Incaparina", now distributed in Guatemala and Colombia, among other countries, is one such product. It has been followed by others, including formulated infant foods, such as "Faffa" in Ethiopia, "Superamine" in Algeria and the United Arab Republic and "Sekmama" in Turkey. Projects to introduce infant-food supplements are also being developed in Iran, Tunisia and Madagascar.[5, 6, 7]

In spite of the limited impact of most of the protein-food projects mentioned above, protein-rich food mixtures and similar products seem to be a potentially good means of reaching the vulnerable groups especially and more successful projects can be expected within the next few years as the techniques of marketing become more refined.

Marketing aspects of new protein-food programmes

Components of a marketing programme. Marketing is considered here in a broad sense as including all the activities needed to develop and successfully distribute a product to a predetermined market. The total marketing programme contains the plan for the implementation of the marketing activities of a company or an organization. It is usually broken down into individual programmes for sets of activities. The general framework of marketing planning should contain marketing objectives, derived from the goals of the company or organization, strategies suitable for reaching these objectives in the course of time, and an activities programme to guide the implementation of the strategies. There are usually three range scales for marketing planning: long-range planning for five years or more, intermediate-range planning for two to four years and short-range planning for six months to one year. The short-range or operating plan is the most detailed plan and is contained in the other plans. Long-range plans show

the general direction which the company or organization should follow and are periodically revised and extended. The operating plans provide the basis for the detailed marketing programming and the various sub-programmes.[1]

The marketing programme is based on pre-set objectives and it should contain a control function, in order to ascertain to what extent these objectives are achieved. The evaluation of the efforts will then form the basis of future planning.

Marketing planning starts with the establishment of marketing goals. The next step is to define and estimate the market and establish a strategy for market development. Against the background of this strategy the total marketing programme can be created. This will represent the total effort that an organization will expend on the market during the planning period. The result of these efforts will to a great degree depend on "the marketing mix", i.e. how the resources are allocated between different activities. Against the general background of the marketing mix, it will then be possible to establish individual programmes for the operation.

The marketing activities are carried out in an environment which defines the company's opportunities and constraints. Whereas the organization can control its marketing activities, which can be considered as decision variables, it has no direct control over the environment. The degree to which the company will achieve success depends very much upon the estimation of the influence of the environmental variables and the forecasts of their development. There are many ways to describe the environment, depending upon what system aspect one considers. From the point of view of the new food programme in developing countries, the most important environmental variables are socio-demographic (describing the attitude, behaviour and structure of the market), economic (describing the economic structure and development in the country), legal (describing the legal framework within which to operate), political (describing the general policy climate of the country), and agricultural and industrial (describing the supply and processing situation). These variables are in turn influenced by the general international environment of the country and influence in their turn the even closer environment of the company, such as the competitive structure and the marketing structure that the company encounters during its operations. Changes in the environment influence the com-

pany to a great extent and it is therefore important to follow them closely. Some may be quick changes, such as those in the political and economic situation, whereas others are slower, such as those in the demographic situation.

Special problems in developing countries. Marketing planning is generally considered a difficult task and is rendered even more so in developing countries because of the special problems that the environment offers. To these problems must be added the difficulties due to the scarcity of statistical data in the form of both background material and statistics on the development of the market. The market-information function therefore requires extra effort.

A successful marketing programme for a new protein food implies that both the middleman (for example, co-operatives, wholesalers, and retailers) and the consumers exert influence in the marketing system. The creation of a market ultimately means the establishment and maintenance of new consumption and buying habits. In programming the marketing activities, the producer works within two different kinds of environments—his internal environment, defined by his production and cost situation, his formulated goals and his financial situation, and his external environment, defined by middleman and consumer behaviour. The behaviour of the middleman is influenced by the producer and also by his own values, beliefs and attitudes, his product knowledge, his general trading behaviour, his profit requirements and his financial situation. A special problem that is encountered in active marketing in the developing countries is the existence of a passive attitude towards marketing, which means that the middleman does not usually push new products but rather serves as an outlet for already successful products for which there is an established demand. His financial situation also may not allow him to take risks with new products. If the middleman is to become a suitable instrument for the producer and help in the distribution of a new product, it is quite important that he should be motivated appropriately. To be able to "recruit" the middleman, the producer must have a great deal of knowledge of what governs the middleman's behaviour. This is, of course, a problem in connection with new products, for which no earlier experience exists. Very often, however, valuable information can be acquired through the study of the marketing of similar products.[4]

There are also special problems in acquiring knowledge of values, beliefs and attitudes in consumption and in obtaining data about general consumption and buying behaviour. Consumers in traditional societies are probably fixed in their habits. Studies of new food programmes in developing countries have shown that it is fairly easy to arrive at high attention and knowledge levels but that the establishment of firm purchasing behaviour is much more difficult.

Planning of marketing programmes—the preliminary appraisal

Aim and method of the appraisal study. There are two critical stages in a marketing project for a new protein-rich food. The first is the appraisal of the suitability of undertaking such a project in a country and the second is the evaluation of the project, once it is under way, to determine whether it should be continued, corrected or abandoned. In between these stages comes the implementation of the programme, which in itself requires much skill and forethought. This paper, however, will only be concerned with the appraisal and the evaluation.

The aim of a preliminary appraisal is to establish whether a protein-food programme would be of help in solving a country's nutritional problems, given the prevalent food and nutrition situation and the general policy required to improve this situation. Once the desirability of a programme has been established, the study should investigate whether such a programme is possible and, if so, what general type of programme would be suitable for the country.[3]

A positive appraisal will result in the recommendation of a technical and economic feasibility study and the laying down of the terms of reference for it. However, the appraisal and the feasibility studies are often combined into one project.

The organization of the appraisal will depend on the status of the national food and nutrition policy and the corresponding organizations in the country. If there is a nutrition institute or a similar organization in the country, the study might very well be the responsibility of this organization, aided by outside experts and possibly outside financing. If no suitable organization exists for the study, it might be undertaken for example, by the Nutrition Division of the FAO, which might plan and supervise the study. The study itself could be financed by the

UNICEF, the UNDP, the FAO/Government Co-operative Programme or other aid agencies.[3]

The preliminary appraisal will usually be based on secondary data already available. The method of study will depend on the degree of nutritional awareness in a country and the availability of descriptive data on the food and nutrition situation. If there are very good data, it might very well be a desk study. This is, however, seldom the case and the experts carrying out the study will have to make some field investigations, such as interviews with institutions, organizations and persons in commerce and industry. Limited field surveys, such as studies of food products on the market, may also be needed.

Provisional identification and description of the nutrition problem. The study should result in a decision on a technical and economic feasibility study and should, if possible, also contain the terms of reference for such a study. This decision must be based on collected data, as has been stated above. Fig. 1 shows the systematic relationship between the various kinds of data to be collected. It can be seen from the figure that the study is a two-stage process, although some overlapping between the two stages is unavoidable.

The first stage consists of a recommendation as to the suitability of a new food programme after the provisional identification and description of the nutrition problems in the country. The second stage, depending on the outcome of the first stage, is the recommendation of suitable products and of a suitable production and distribution method for such a programme.

The investigation in the first stage should cover the following areas:

1. *Production situation and forecast.* General description of the agricultural and industrial production situation, especially with regard to raw materials and food-processing facilities, and a forecast of the development of this production.

2. *Foreign-trade situation and forecast.* Description of the foreign-trade situation, especially with regard to food products, and a forecast of the development of foreign trade and the development of the terms of trade.

3. *Consumption situation and forecast.* Description of consumption with breakdown into various product groups, description of consumption distribution between consumer groups, geographical areas, etc., and

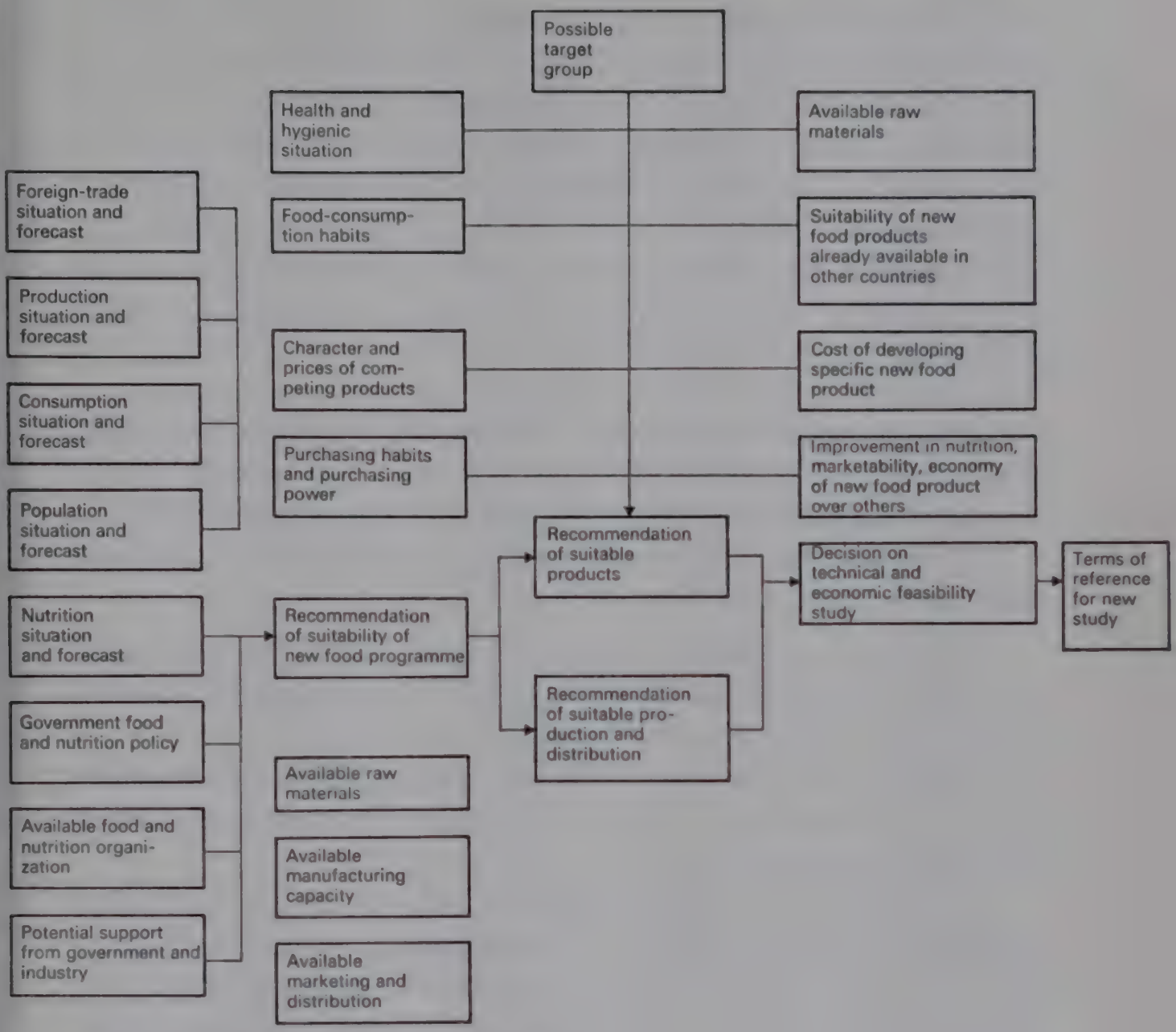
Possible target group
Health and hygienic situation
Available raw materials
Foreign-trade situation and forecast
Food-consumption habits
Suitability of new food products already available in other countries
Production situation and forecast
Character and prices of competing products
Cost of developing specific new food product
Consumption situation and forecast
Purchasing habits and purchasing power
Improvement in nutrition, marketability, economy of new food product over others
Population situation and forecast
Recommendation of suitable products
Decision on technical and economic feasibility study
Terms of reference for new study
Nutrition situation and forecast
Recommendation of suitability of new food programme
Recommendation of suitable production and distribution
Government food and nutrition policy
Available raw materials
Available food and nutrition organization
Available manufacturing capacity
Potential support from government and industry
Available marketing and distribution

Fig. 1. Components in an appraisal study.

description of income and purchasing power. Forecast of the development of consumption.

4. *Population situation and forecast.* Description of population with regard to size, age structure, nativity and mortality, geographical distribution, mobility, and distribution between urban and rural areas. Forecast of population development.

5. *Nutrition situation and forecast.* With the background of the information under 1–4, it should be possible to describe the present nutrition situation and its development and broadly assess the extent of malnutrition and identify vulnerable groups.

6. *Government food and nutrition policy.* Analysis of the existing

food and nutrition policy of the government and an evaluation of the part to be played by a new protein-food programme within this policy.

7. *Available food and nutrition organizations.* Description of existing research on nutrition problems, both basic and applied, and analysis of the capacity of available organizations for improvement of food and nutrition status.

8. *Potential support from government and industry.* Evaluation of the potential interest of government and industry in a possible new food programme.

New protein-food programmes as a feasible solution. The second stage of this study is the recommendation of products and production and distribution organization for a possible new protein-food programme.

For the recommendation of suitable products, it is necessary to collect the following kinds of information:

1. *Possible target groups.* From the information from the first stage, some possible target groups should be selected, such as mothers, children at the weaning stage, and school-children.

2. *Food-consumption habits.* The new food product must fit into present food-consumption habits and a description of such habits should be made for the target groups.

A contemplated new product may take many forms. In the case of supplementary foods for infants and pre-school children, gruels have been most common, but there are also other beverage-type foods like "Incaparina", based on the domestic "Atole" drink. For some target groups, such as school-children, a pasta product or a biscuit might be more suitable.

3. *Purchasing habits and purchasing power.* Food-purchasing habits with regard to place of purchase, frequency of purchase, and type of purchase by target groups must be investigated. The available purchasing power of these groups should be described.

4. *Type and price of competing products.* An analysis of similar products which might compete in the future and an investigation into prices, margins, brand names, type of packages, protein content, etc. should be made.

5. *Health and hygienic situation.* Investigation of the situation in which the new product will be prepared, for example, the necessity of boiling water for health reasons.

6. *Suitability of products already available in other countries.* Discussion of the possibility of introducing various previously developed food products into the specific country.

7. *Cost of developing specific new food products.* Possibility and cost of making special food mixtures for the specific country.

8. *Available raw materials.* Evaluation of raw materials suitable for new products with regard to protein content, suitability for food mixture, etc.

9. *Improvement in nutrition, marketability and economy of new food products over others.* Rough calculation of the various benefits that would ensue if a special product were developed for the area.

If the general analysis in the steps outlined above leads to the recommendation of suitable products, it will then be necessary to give some views on a suitable organization for the production and distribution of these products. Even though the nutrition situation and the raw-material situation in general warrant a new product, it might still be advisable either to avoid introducing it because of weaknesses in the production and distribution system or to incorporate correctives to these weaknesses within the development project. It is therefore necessary also to take the following factors into account:

1. *Supply of raw materials.* Viewpoints on the supply, quality and prices of raw materials for the food products suggested.

2. *Available manufacturing capacity.* The possibility of using existing producers or the need to establish special new facilities.

3. *Available marketing and distribution organization.* A broad description of the general marketing system in the country with regard to marketing channels and middlemen, methods of marketing, pricing, etc. Description of institutional distribution channels.

Control of marketing programmes—principles of programme evaluation

Aim of the evaluation. There is an increasing awareness of the need for the evaluation of development programmes. The task of evaluation is intricate, since it represents problems of both definition and estimation. In purely commercial enterprises, there has always been a built-in evaluation in the form of the profit-and-loss statement and the profit realized

at the end of the year. In non-commercial enterprises, where it is very often impossible to use economic measures, the problem of programme evaluation is much more difficult. The evaluation of a marketing programme for new protein foods has to be considered in both its commercial and its non-commercial aspects.

The evaluation serves a dual purpose. First, it should show whether the total project has achieved the goals that were set at the beginning of the programme and, second, it should also show the technical efficiency of the complete programme and that of its various parts. There is a relationship between these two aspects and ultimately the evaluation has to be considered as a whole with regard to the total efficiency of the programme. The evaluation should be considered from the point of view of various interested parties. The evaluation of goal fulfilment is of special interest to the government agencies responsible for the food and nutrition policy, and in this respect the programme will be considered a part of the policy. The internal aspects are of special interest to the management of the programme and will indicate possible changes to increase programme efficiency. Considerations of technical efficiency will apply both to the complete programme and to the individual parts of the programme.[2]

The evaluation should be considered a continuing activity, in which new information will gradually be gathered and used in setting more specific goals, increasing the technical efficiency and also setting standards for future evaluations.

The evaluation programme in its system context. The food and nutrition problem has very many aspects and is dependent on the cultural system, the industrial system, the consumption system, etc. The introduction of a new protein-food programme may have effects in a wider system than that defined by the narrow enterprise context. One may distinguish a number of subsystems, including suppliers, employees, various government agencies, middlemen and consumers. The new programme may mean that both costs and benefits can accrue in these various subsystems. A narrow way of regarding the system is to consider only the enterprise in question and to evaluate its cost and revenue. The revenue reflects the sales volume and the cost reflects the resources used in achieving this sales volume. Usually one does not only evaluate on the company level but also includes the consumption system and

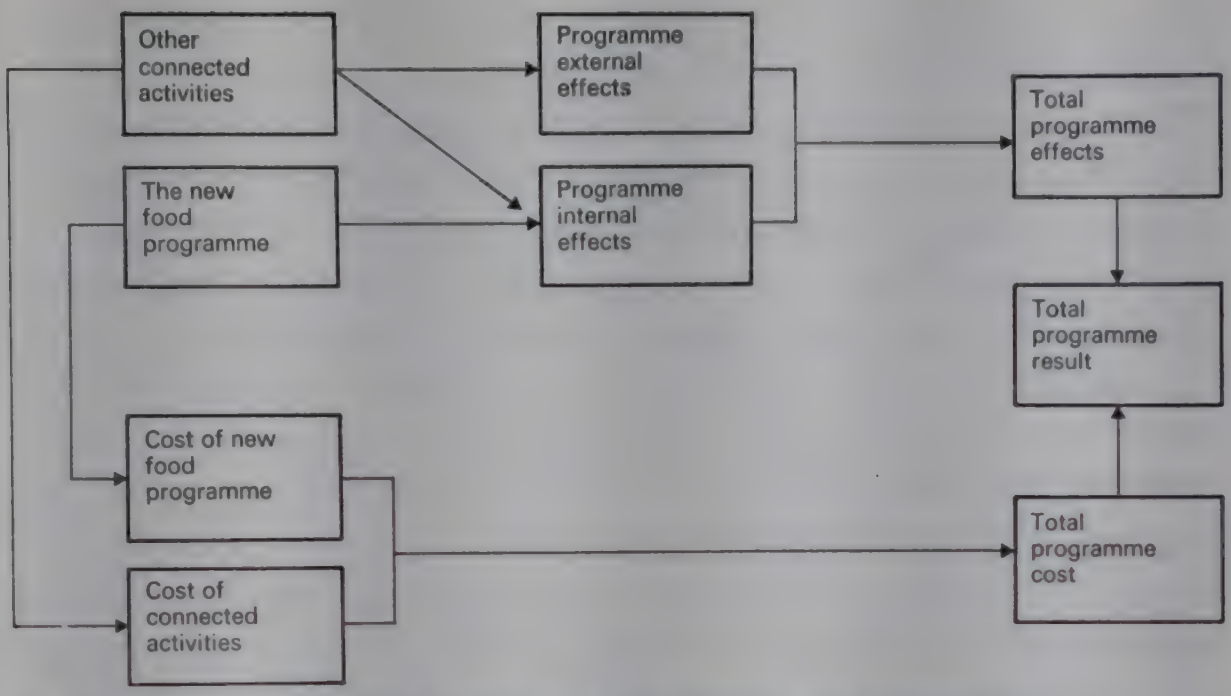

Fig. 2. Internal and external effects of a new protein-food programme.

determines how consumption is changed. The output measure will then be some desired consumption effect, instead of the sales volume.

To be able to evaluate the full impact of a project, one should also take into account possible external effects, which may be either positive or negative. If, for example, the new protein food successfully competes with some other food that middlemen previously sold and which yielded a certain revenue, the introduction of the new food might lead to decreased sales and lower profits, which would then be a negative effect for the middlemen.

The project depends for its success on the supporting activities of other organizations, such as hospitals, educators, radio stations, etc. The relationships are shown in Fig. 2. The new food programme will thus require the help of a number of connecting activities. For both the new programme and these other activities there will be certain costs which will be included in the total programme cost. The activities will lead to internal programme effects, which are effects directly related to the programme goal and which show up primarily in the form of the sales volume and secondarily in the form of consumption changes. There will also be external effects, both from the programme and from the connected activities. Such external effects may be as follows: for the consumers, increased awareness of nutrition and health problems; for other producers, the establishment of a distribution system which may

lead to the cheaper introduction of similar products in the future; for the middlemen, increased profits from the new products (which may be offset by a decrease in profit due to the loss of sales of other products); and for suppliers (farmers), increased demands for product ingredients. The programme may also lead to an increased nutrition awareness within the government, resulting in new actions. The programme's internal effects and the net positive external effects will add up to the total programme effect, which should be compared with the cost. It is usually enough to discuss the internal effects in the evaluation of the new food programme. External effects may exist, however, which will help in justifying the new food programme. As an example, the new protein-food programme may be an excellent vehicle for nutrition education. Even though the new food programme shows an excess of costs over benefits, the external educational effects may be enough to offset this.

Evaluation criteria. A new food programme which ultimately does not lead to an improvement in nutrition must be considered a failure. At the outset of the programme the nutritional deficiencies of the target groups were defined and the evaluation should serve as a proof that these deficiencies have been reduced. This means that it is not enough to know that the product has been sold and consumed; it has also to be shown that the product has been consumed by protein-deficient consumers. It has furthermore to be proved that the product has been used by these consumers in such a way that their nutrition has been improved. No other negative consumption effects should have occurred, for example, the consumption of other foods should not have been diminished on account of the new product. The estimation of the nutritional effects will call for knowledge of (*a*) the nutritional status of the recipients of the new foods, (*b*) the consumption patterns in which the new food has been used (even though the consumption of 100 grammes a day of a 20% protein-food product is envisaged by the nutritionist, the consumer may well use it in another pattern, for example, 100 grammes every three days or 20 grammes a day for five days), and (*c*) the relationship between the consumption of various amounts of the new protein foods and the improvements in nutrition for different types of protein-deficient consumers. This implies that the "marginal effects" of a gramme of protein may be different in different contexts.

The evaluation is an assessment of the relationships between various inputs and outputs, either of the whole programme or of its individual parts. The whole programme leads to the desired nutritional effects through the combination of activities. Some of the activities will have intermediate effects only, which may be considered means of achieving the ultimate effects. It is often not possible to evaluate all the programme activities in the light of the nutritional effects, and other output criteria must be used.

The most extensive evaluations of protein-food programmes so far have been undertaken on behalf of the INCAP; the latest of them were conducted in Guatemala in 1968. The preliminary results reveal that 92% of all the families interviewed were aware of the product and only 16% had never tried "Incaparina". Six out of ten consumers are consuming "Incaparina" and more than half of them are using the product regularly. The penetration is greater in families with incomes above US $100 a month (76%) and goes down to 61% in the group with incomes between US $20 and 100 a month, and 29% in the families with incomes of less than US $20 per month. The penetration is about twice as high in urban areas as in rural. About 350 000 Guatemalan families are consuming "Incaparina" with an estimated average consumption of about 3 kilogrammes per family per year, which would give a protein supplement of about 800 grammes per family, a seemingly low figure from a nutritional viewpoint. There appears to be considerable consumption of "Incaparina" also outside the most vulnerable groups, since the product is promoted indiscriminately to the total population and is designed for the whole family.

In the Ethiopian "Faffa" programme, the nutritional goal was to supplement the ordinary diet of an undernourished child by giving it 100 grammes of "Faffa" a day, containing about 20 grammes of protein. With this goal in mind, as many children as possible should be reached. The nutritional requirements were set up as average needs, based on data from field studies. It was assumed that the nutritional deficiencies would be greater in urban areas than in rural cash-income areas. There were, however, no quantitative estimates of the relationship between the nutritional situation and these indicators. An analysis of a survey among 2 000 households in the Jimma region in Ethiopia shows that there is a consumption yearly of 20–25 kilogrammes of Faffa per child among the 25% of the households using the product. This

implies that each child gets a daily supplement of 11–14 grammes of protein per day, which must be considered a very successful result. However, the figures only apply to the period of investigations, but there are reasons to believe that these consumption rates will prevail.

To be able to evaluate the impact of this and, if necessary, to influence the consumption patterns in a more favourable direction, it is essential to establish how various amounts of protein supply influence the nutritional situation. There may be many patterns in the combination of frequency of consumption and average daily consumption. It has to be established whether the relationship between the input of protein and the nutritional effect is proportional or not. It may be assumed that there is a lower limit for the daily supplement, below which no discernible effect will occur. This is a question that must be answered by nutritional and medical specialists as a basis for the establishment of meaningful goals and for the direction of marketing activities to achieve these nutritional goals. It is also necessary to evaluate the extent and character of malnutrition in different regions, in order to be able to direct the activities. In establishing nutritional goals, one should not neglect the potential risk of a substitution effect, where the "Faffa" product may be substituted for other products in the consumption pattern and the resulting situation may not be as good as was expected and may be even worse.

Once an evaluation of a programme has been undertaken and it has been shown that success or failure has resulted, one should look for the reasons. Very often the reasons for failure can be found in the product itself or in the marketing. Attempts to commercialize "Incaparina" in Nicaragua failed because of lack of experience on the part of the food industry selected for participation and poor planning before the full-scale commercial distribution. A similar failure in El Salvador is assumed to have occurred because of a too early introduction before adequate acceptability and market testing had been carried out. If these tests had been undertaken, there could have been product modification, etc., which might have turned the failure into a success.

References

1. Kotler, P.: *Marketing Management, Analysis, Planning and Control.* Prentice-Hall, Englewood Cliffs, 1967.
2. Little, I. M. D. & Mirrlees, J. A.: *Manual Industrial Project Analysis in*

Developing Countries. Volume II. *Social Cost-Benefit Analysis.* Development Centre of the Organization for Economic Co-operation and Development, Paris, 1969.

3. *Manual on Food and Nutrition Policy.* Food and Agriculture Organization of the United Nations. FAO Nutritional Studies No. 22, Rome, 1969.
4. Moyer, R. & Hollander, S. C.: *Markets and Marketing in Developing Economies.* Irwin, Chicago, 1968.
5. Wickström, B.: Experience in Marketing a Supplementary Food Mixture for Children in Ethiopia. In Max Milner (ed.): *Protein-enriched Cereals for World Needs.* A.A.C.M. Inc., St. Paul, Minn., 1969.
6. Wickström, B.: *Marketing of Protein-rich Foods in Developing Countries.* PAG Guideline No. 10, 1971.
7. Wilkie, N. A.: Marketing Strategies in Developing Countries to Combat Infant Malnutrition. In Proceedings SOS/70, Third International Congress, Food Science and Technology, Chicago, 1971.

Nutrition-implementation Programmes as Communication Systems

By ANDREAS FUGLESANG*

Traditional nutrition programmes in developing countries have generally been handled by people with medical or agricultural backgrounds. It is gradually becoming clear that other professional skills may be just as important. In this paper, the implementation of nutrition programmes is discussed. Only by the systematic application of mass communications in the widest sense of the word can effects on the national scale be hoped for.

People who have been working on nutrition-implementation programmes in the field can hardly have avoided suffering from occasional attacks of the sort of professional or conceptual spleen which derives from the general lack of clarity—from the lack of defined objectives and choice of options as regards the means to achieve them, lack of the conceptual tools necessary to describe and structure the mass of practical implications of the programme. In short, lack of meaning and consequently very often lack of motivation for the kind of dynamic and creative action which produces results in practice. Hence an attempt at structuring the professional reality in this respect may be of some value, both from the point of view of mental hygiene and practical applicability.

Social change and decision-making as communication processes

The problem can be outlined fairly comprehensively in a couple of simple questions. What is it we wish to achieve with nutrition-implementation programmes and by what means do we wish to achieve it? What happens

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in practice and what should happen when we are planning and realizing such programmes?

Scratching the surface of the problem immediately reveals some assertions which seem fruitful for further analysis. Malnutrition or under-nutrition is not a medical problem. It is in the widest sense a *social* problem. Our ultimate objective is the eradication of malnutrition and under-nutrition. In other words, the objective is behavioural change concerning food production and consumption, i.e. a definable social change.

A means to this end is the application of an integrated set of what we may describe as change variables, which we consider *a priori* relevant to the purpose. These variables include both the quantitative and qualitative aspects: (1) food production, (2) food distribution/marketing, (3) home economics, (4) health services, (5) community development, (6) education/information.

Social change results from interaction between the individual and his total environment. Some variables, like (6), education/information, are *communication* variables and produce psychological changes in the individual. Others, like (1), food production, produce changes in the socio-economic and physical environment. Social change occurs when a number of individuals interact with the new opportunities for action which are offered by the environment. However, if the variables concerning the latter are examined more closely, we shall find that they have a striking common characteristic. They are also very extensively linked up with various types of communication activities. Variable (1), food production, is an illustrative example. Depending on the local situation, some input of capital investment in technology, machinery, tools and fertilizers will be necessary. But there is probably general agreement that the most decisive input factor is agricultural extension work through field officers, radio farm forums, etc. Another example is (4), health services. Investment in clinics, equipment, doctors, etc. is needed. But the contact between the clinical staff and the people depends on a pure communication factor.

On the other hand, the nutrition-implementation programme itself seems to be loaded with communication activities, both internally and in the general interaction of the programme staff with the society. For example, the relative effect-value which is accorded to the various variables and the "mix" the variables are applied in are the results of

a decision-making process. Information is collected, processed and evaluated.

These aspects of the means we apply and what happens when we apply them makes it seem promising to describe nutrition-implementation programmes as communication systems. The criterion of whether such a description is valid lies in its usefulness as a tool for understanding and solving problems in practice.

The programme—a series of operational fields

Ideally, one should be able to break down an implementation programme into a series of *operational or functional fields,* in which the consumption and production of information is taking place. Each field is in a state of interaction with the preceding or subsequent fields, in the sense that the output in one field is consumed as the input in the next. In other words, the series of operational fields represents a continuum.

The first field, F1, is the *production of data* (cf. Fig. 1). This field comprises two functions, the *collection* of data and the *processing* of data. Presumably research on food consumption and/or nutritional status will always initiate an implementation programme, but it is conceivable that this is not so. It may not be thought necessary to acquire data. The next operational field is F2, *evaluation of data production.* This field also comprises two functions, the *analysis of data* and the *production of decision alternatives.* There is, or should be, a two-way interaction between fields F1 and F2 in the form of a production control. Proper methodology demands a built-in, call-back system to this end. The decision alternatives are fed into F3, which may suitably be called *decision-making.* The sub-functions in this field are the *definition of main objectives* and the *production of decisions.* When decisions are produced, they are fed into F4, the *planning* field where the plans are produced. Planning may be defined as the description of procedures for reaching specified objectives. In practice, it will therefore comprise the function of *defining partial objectives* and the *description of means* of achieving them.

Then, of course, we hope that the plans will be implemented. F5, *implementation of plans,* comprises both the preparation and the application of means, but a distinction does not seem to serve any purpose. Finally, a nutrition-implementation programme should have a built-in

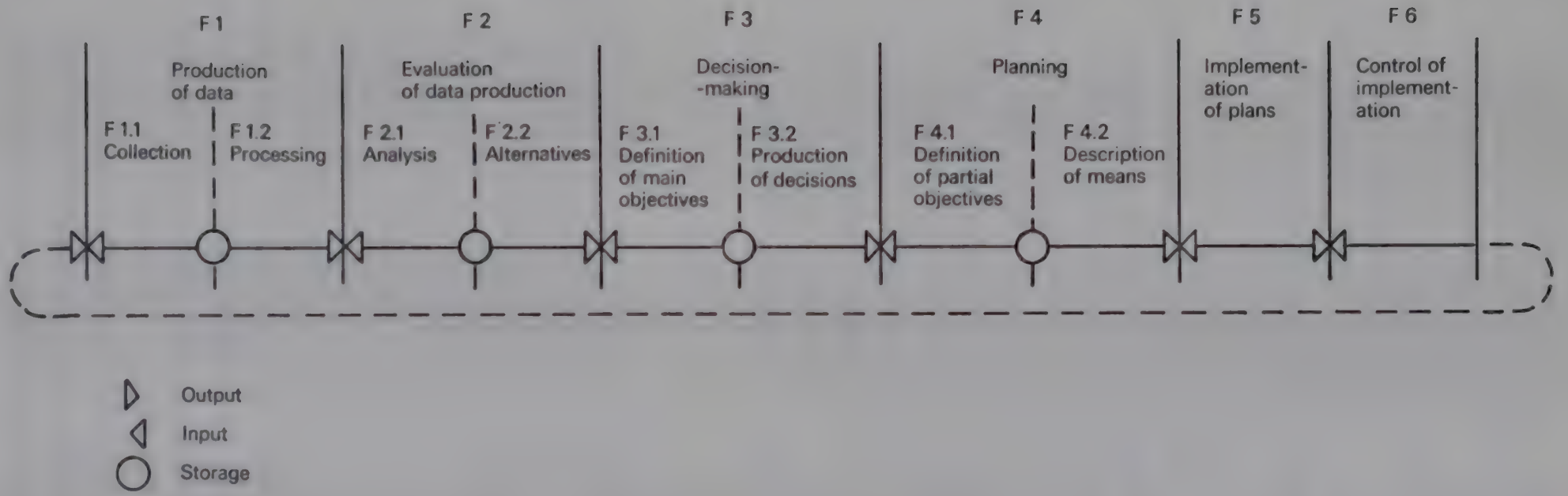

Fig. 1. A nutrition-implementation programme.

control system, based on the measuring of effects. F6, *control of implementation,* is a field which functions in identically the same way as F1, *production of data.* F1 should ideally comprise baseline studies of information or knowledge levels and levels concerning nutritional status, like anthropometric and bio-chemical measurements. Such data are necessary for a later assessment of the changes resulting from implementation activities. Baselines are also necessary for an exact definition of objectives. In fact, plans cannot be made nor procedures described, unless the objectives have been defined exactly.

However, this cannot be considered a completely defined system in itself. There is continuous interaction and communication with the social environment. It results in plus-input, which is defined in relation to the objectives of the programme, either interference or additional information. Depending on the operational field in question, this input varies in quality and quantity. For example, in F3 there is likely to be a considerable interference from politicians concerning the definition of objectives and the actual decision-making. A large degree of interference from the environment is also likely to come about in F5, implementation, whereas small degrees of interference are likely in F1 and F6, where the performance is highly technical and professional.

A pragmatic system

A nutrition-implementation programme as a communication system is oriented towards fulfilling certain objectives. Hence it can be called a *pragmatic system* (cf. Fig. 2). The information which is turned over in the system is pragmatic information, i.e. information which serves the ultimate purpose of fulfilling a defined set of objectives.

In this sense the system works with a redundancy of information, which is screened by a set of criteria determining what is necessary for the achievement of its objectives. The system is selective. It rejects information which does not reduce the field of uncertainty in decision-making. That this does not happen very often in practice, due to lack of clarity as to objectives and procedures, does not exclude the principal necessity of such a feature.

The pragmatic viewpoint also implies other aspects which should be mentioned. For example, one of the basic criteria for the screening of information must be profitableness in relation to the achievement of

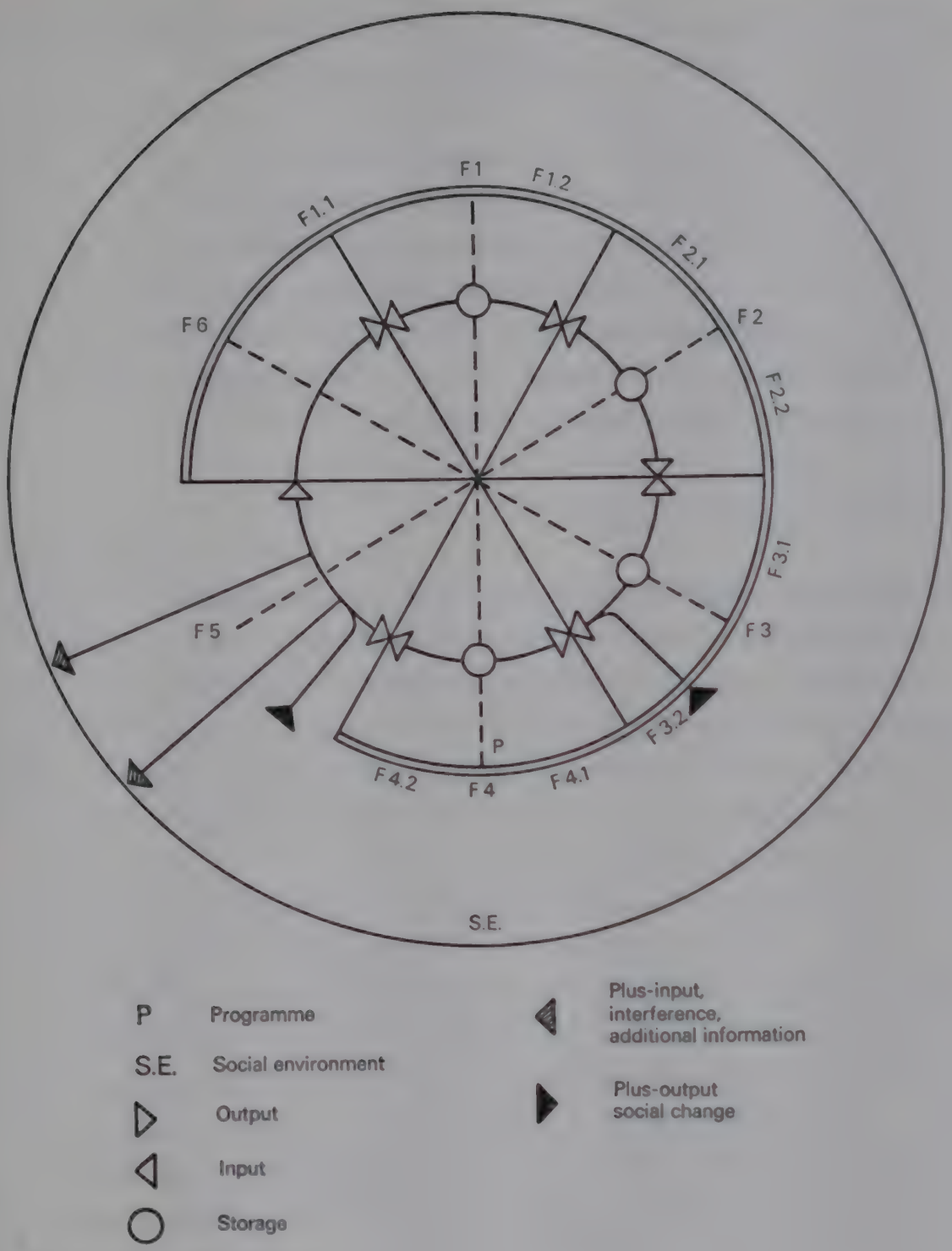

Fig. 2. A pragmatic system.

objectives. A consequence of this is that all functions in the system must be currently evaluated on a cost-control basis. Finally, the nutrition-implementation programme is, as a communication system, in constant interaction with the environment. It is an open system.

I do not say that the system exists. Nor do I say that it is possible to establish it in practice in its entirety. What I do say is that I find it a reasonably coherent model, describing the ideal working of nutri-

tion-implementation programmes. (It may be relevant also to most kinds of integrated development-implementation programmes.)

Hence the model can be used as a tool for the analysis and description of nutrition-implementation problems in practice and may add to our understanding. It can also serve as a guideline for the functional administrative set-up of the implementation programmes, a set-up which can cope with the flood of practical problems in a more rational way. As for any conceptual tool—as I pointed out before—the ultimate criterion for the justification of the model lies in its fruitfulness in the observation, analysis and description of reality.

From information to action

The functional objective of a programme is to transform information into action which will lead to social change. This is done by a selective process called decision-making. This reveals immediately the mutual dependency between F1, *production of data,* and F3, *decision-making,* in the sense that criteria for the quantity and quality of research needed can best be found by analysing the actual role which research data play in the decision-making process.

It is a widely experienced fact, and not only in developing countries, that decisions which imply some kind of encroachment in the social environment are not made but are rather imposed by political and socio-economic realities. The horizon of choice which is left to the professionals in the programme is narrowed to almost nothing. For example, of a series of villages, A is pointed out by the local-government authorities as a site for an implementation scheme, not because it is especially well suited from a nutrition point of view, but because it has the highest attendance at the polls.

The pragmatic approach in research

However widespread, the research undertaken can in most cases cover only a small section of the social reality involved when implementation is taking place. A food-consumption survey can, for example, quantify the pattern of food consumption in a certain village, but the ecological and sociological circumstances which condition this pattern are left untouched. The simple fact is probably that decisions on implementation

and development in general must be made and are made all the time in the absence of "sufficient" knowledge.

If there is need for more research, it is not for more field research, but for research on the extent, if any, to which field-research data are actually used in the decision-making process, both inside and outside the programme. If the degree of utilisation is very low, there is reason for a change in the particular research policy, which seems to me so far to have been predominant in international and bilateral development programmes. To take action on the *assumption* that knowledge *per se* is good is not rational behaviour but a manifestation of academic prejudice. It is a great mistake for us to behave as if research data were going to be used, if they are not. Their mere presence does not conjure forth a change in the reality.

We are working in a pragmatic system. Our criteria are a high degree of utilization and optimal profitableness in relation to objectives. Our research must be subjected to a rigorous production control on this basis. It must be tailored to meet practical needs, not academic ambitions. Above all, research must not be initiated unless it is integrated in an implementation programme. For those who work in a practical context in a developing country, it is not pertinent that this view should be met with a reference to the necessity of basic research. The frame of reference specifies *applied* research.

The questions as to the quantity and quality of research data are very simple. How much can we afford to pay for on our budget? What statistical precision can we afford? Sampling in the bush ceases to be a scientific issue, and becomes an economic consideration.

Nutrition—and other kinds of field research in developing countries—is not pure science, but plain and common consumer or market research. The research objects are the same, the sampling theory, the methodology, the statistical techniques. This may be recognized, but the consequences are mostly not. Few company presidents would risk using much more than 20% of their marketing budget on research, reserving 80% for the implementation part of the programme. In the cases of field research in developing countries where implementation is cared about at all, the percentages rather seem to be reversed.

Modern consumer research also offers other parallels for consideration, namely, that research data are used for the definition of objectives by quantification. Forecast increases in information level about the

consumption levels of certain products, for example, represent vital information when the means of implementation are to be decided on. The objective of a nutrition-implementation programme should, for example, be formulated somewhat as follows: "To raise the protein intake of population X in area Z from a baseline of 40% to a level of 90% of requirement in a period of 5 years".

How data are utilized

The question raised previously about the extent to which field-research data are actually used in decision-making goes a bit deeper than that. The problem is also how the data are utilized. In this connection we must take a further look at our models and incorporate also F2, *evaluation of data production,* and F4, *planning.*

The distinction between F2, *evaluation,* and F3, *decision-making,* is pragmatic. However much these fields overlap in practice, it is important to be clear on this point. The function of evaluation in a pragmatic system is the analysis and production of decision alternatives, and it is, as such, a job for the specialists, i.e. for the statisticians, the nutritionists, and the paediatricians, whereas decision-making, with its definition of objectives and actual production of decisions, is done in practice by the administrators, usually strongly influenced by the politicians. That the former, by their mere choice of a set of decision alternatives, influence the latter is another matter.

Further, there is also overlapping between F3, *decision-making,* and F4, *planning.* But again, it is, from a pragmatic point of view, essential to retain a distinction. The main objectives are set up and the main decisions on nutrition-implementation policy are taken by people who are not competent to make plans, i.e. to produce the procedural blueprint. Much is compiled and lined up in columns on paper under the pretence of making plans, blatantly ignoring the most elementary rules of the game, for example, the rule that it is logically impossible to describe the means or procedures for achieving an objective *before* the objective itself has been defined and, preferably, quantified. Planning should also be left to the professionals.

Observing the sequence of formal events in F1, F2, F3 and F4, we may now discern how research data are utilized in an implementation programme. Whether it be the processing of data, the production of

decision alternatives, the actual decision-making or the planning, we should not be astonished to find that none of these operations is based on cool logical deductions from research data. On the contrary, they form by their very nature a progressively intricate pattern of inductions, in which data seem to disappear instantly. Apart from desk-drawers, there is no organisational or administrative set-up which can automatically store, recall and transform research data into implementation action. The data are simply left at the mercy of the programme staff's will, skill, judgement or, let us say, creative ability. They are utilized as raw material in a creative process serving the purpose of making the results of this process optimally relevant. No theorem, no hypothesis has ever been deduced from a series of facts. They are created—and possibly not falsified. (We have to accept the logical notion that no hypothesis can ever be verified.) Implementation is a hypothetical activity, the validity of which can only be falsified by experience. Hence the success of an implementation programme depends probably much more on the quality of its staff than on the quality of its research data.

An example from practice may be illustrative. In an area which has been quickly surveyed for the food consumption and the nutritional status of the population in a couple of villages, it has been found that the protein intake varies from 40 to 60% of the requirement, and this finding is correlated with below-normal anthropometric measurements etc. A vastly more expensive survey on a stratified sample of 85 villages in the area reveals that the figure actually is 55.34%—to be precise—and it adds, of course, a variety of trimmed cross-tabulations and fine correlations. This is *not* food for thought. I am not concerned with what some Ph.D. candidate is going to dish up at Subtleby University next year, but with my friends in Lakuba village and the bitter reality of their lives today.

Assessments on such levels of precision are too expensive and, from a utilization point of view, utterly irrelevant for implementation, which operates no less efficiently on very coarse measurements. What is needed in nutrition-implementation programmes is cheap action-oriented research, providing major guide-lines and then ample investment in the professional administrative staff of the programme and in the actual implementation activities.

A management problem

This leads us on to some fundamental considerations of another field of operations, i.e. F5, *implementation.*

The so-called integrated approach, which is widely accepted as the basic concept in nutrition-implementation programmes, and has previously been described in this context as a set of change variables, reflects to some extent the state of affairs in nutrition as a subject and profession. Sometimes confusion of concepts, due to lack of a consistent theoretical framework, sometimes a slight professional insecurity, revealing itself in over-indulgence in aspects of the subject which are susceptible to measurement, in short, the growing pains common to most interdisciplinary subjects or professions. A state which does not always make possible the pertinent judgement of the practical implications, for example, the simple recognition that the administration of an implementation programme is not a "nutrition" problem but a *management* problem and should consequently be solved as such.

In practical field-work, one also sometimes has a tendency to think that nutrition is such a special subject that it needs an extension service of its own. This is hardly feasible and is at least very contradictory to the idea of the integrated approach, the basic idea of which is that nutrition should be integrated in the already existing activities within health services, community development, agricultural extension, formal education, etc.

Along these lines of thinking, we ultimately end up in the problem of the relationship between a nutrition-implementation programme and the administrative infrastructure in the country concerned. Interaction with the Government, civil service, political parties and a variety of social pressure and interest groups is vital. In this context the importance of the quality of the programme's performance as a communication system can be recognized.

APPENDIX

The National Food and Nutrition Commission of Zambia

Nutrition work has a long tradition in Zambia. Systematic surveys were carried out in various parts of the country as early as the late forties, but it was only in 1966 that nutrition was made an issue of national importance.

In that year, a team of FAO/WHO experts was invited by the new Government to make an assessment of the situation. The team recommended an extensive national food-consumption and nutritional-status survey and the creation of an independent, administrative, nutrition body.

Data on a national scale were lamentably lacking, but all investigations indicated that the mortality of pre-school children was at least 30%, possibly as high as 50%. The Schools Medical Service on the Copperbelt and in the area of the capital, Lusaka, found that 25–27% of the children examined had marked signs of malnutrition. A further 50–60% had signs of under-nutrition or milder malnutrition. This was, *nota bene*, in the more affluent parts of the country. Worse conditions could be expected in isolated bush villages.

The Government acted immediately on this information. A Cabinet decision on a National Food and Nutrition Programme was taken in March 1967. The National Food and Nutrition Commission Act completed its passage through the National Assembly and received the Presidential assent in July 1967.

Organization

By September of the same year, the Commission's Office was operational under its first Executive Secretary, Mr. E. C. Thomson, who had played an important role in the preparations and continued to do so during the first crucial years of planning and practical implementation.

The National Food and Nutrition Commission has a membership of five persons, who all have high professional standing and influence in their fields. They are civil servants and professional men. Their professions vary; at the present time, education, agriculture, medicine and community development are represented. The chairman is Professor L. K. H. Goma, the Vice-Chancellor of the University of Zambia.

The executive arm is the Office of the Commission, which is a full-time administrative centre for the national food and nutrition activities. Mr. Alex Vamoer is now directing the expansion as Executive Secretary. He is assisted by an Assistant Executive Secretary, a nutritionist and other professional and administrative staff.

The Commission is in a unique position to take initiatives and to co-ordinate action in the food and nutrition field. With its authority as an inter-ministerial statutory body with access direct to the Cabinet through the Minister of Labour and Social Services personally, it is also able to influence the national development planning. For this reason, the Commission has been much concerned with the relationship between the nutritional status of the population and national productivity.

Work programme

The nation-wide, food-consumption and nutritional-status survey, which is now near its completion after 3 years of field work, is designed to supply national planners with the data they require. Projects aimed at special cadres of the nation's labour force are in operation. Workers' feeding, boarding-

school feeding and supplementary day-school feeding programmes have been given high priority. The vulnerable groups are also in the focus of attention. Zambia is building up an extensive system of preventive mother-and-child services, based on the concept of the "under-five" clinic. More than 400 such clinics are already in operation all over the country.

By Presidential decree, the Commission also acts as the National Freedom from Hunger Campaign Committee. This makes it possible to co-ordinate voluntary work with Government activity. "Nutrition groups", which undertake the non-profit-making sale of protein-rich foods and combine it with nutrition education, are widely operative.

The Commission is basically financed by the Government of Zambia, but some of the individual projects which the Commission has started are also partly financed by contributions in kind or money from international organizations or bilateral agencies.

Nutrition education

A special feature of the Commission's organization is the Public Relations Unit. It is a separate entity headed by a director (a communications expert) and has a highly qualified professional staff: photographer/cameraman, graphic artist, radio producer/scriptwriter, journalist/editor, secretaries and storage/distribution workers. It has ample office space and all the modern equipment needed for a professional operation, viz.:

(*a*) A small sound studio for pre-recording broadcasts. High-performance portable tape-recorders for field reporting. Radio Zambia's studios are also available for programme recordings.

(*b*) A photographic studio with projectors and facilities and a complete set of still cameras.

(*c*) A dark-room equipped for processing both black-and-white and colour film in all sizes. Enlargers, automatic dryer, etc.

(*d*) A 16-mm film camera. Viewer and equipment for film-editing. Sound-recording is done in the studios of Zambia Information Services.

(*e*) A reproduction camera/enlarger for the graphic artist. Carbon-ribbon electric typewriter for typesetting and complete Letraset material for headline work.

(*f*) Semi-automatic Addressograph machine with 10,000 embossed name-plates for distributing material to all key people and contact men.

(*g*) A Landrover with generator and complete equipment for film and slide projection, used for the reproduction and testing of all material in the field.

Apart from the actual printing, which is done by the Government Printers, and the film-laboratory processing, the Unit is, in other words, entirely self-sufficient. It produces everything in the various stages from manuscript to graphic art-work ready for final reproduction in print, tapes ready for broadcasting, exhibition stands on the spot and slide series and films ready for synchronization and duplication.

The staffing and equipment of the Public Relations Unit obviously make it capable of something more than the traditional activity of nutrition educa-

tion. The objectives laid down in the statutes of the Commission present the Unit's staff with nothing less than the formidable task of implementing a national nutrition information and education campaign covering all levels of the population in all parts of the country.

The Director for the first 3 1/2 years was Mr. A. Fuglesang, a Norwegian communications expert. The present Director is Mrs. A. Jere, a Zambian sociologist who has chosen communications as her speciality.

It is both unnecessary and impossible to give a comprehensive report in this context on the wide variety of nutrition information and education activities which the Unit is running. This has been done elsewhere in the series of publications specified in the references, which can be obtained from the Commission on request. Interested readers are recommended to write directly to the Director, Public Relations Unit, National Food and Nutrition Commission, P.O. Box 2669, Lusaka, Zambia.

Notes and references

1. "Nutrition in Zambia" (PRU/NFNC, Lusaka 1968). An illustrated booklet on the integrated approach to nutrition work.
2. "Outlook on a National Nutrition-education Campaign" by A. Fuglesang (NFNC, Lusaka 1971). An illustrated booklet on the principles and practices of the campaign.
3. "PCM Malnutrition" by Dr. L. Burgess (NFNC, Lusaka 1969). An illustrated booklet on its diagnosis and treatment, for nurses, medical assistants and personnel with similar qualifications.
4. "ABC of Nutrition" by B. Thomsen (NFNC, Lusaka 1969). An illustrated booklet for the secondary-school level.
5. "Simple Nutrition Teaching Handbook", included in a complete nutrition teaching kit with 12 posters (PRU/NFNC, Lusaka 1968). For the primary-school level.
6. "Tips about Nutrition Teaching Aids" (PRU/NFNC, Lusaka 1969). A folder on the handling and use of visual aids.
7. Annual Reports from the National Food and Nutrition Commission, 1969, 1970.
8. "Before, When and After the Baby is Born" (PRU/NFNC, Lusaka 1971). Three booklets on nutrition and mother-and-child health care for use as curriculum in functional adult-literacy campaigns.
9. "Nutrition News" (PRU/NFNC, Lusaka), Nos. 1, 2 and 3, 1970, and No. 1, 1971. A newspaper on nutrition work in Zambia.
10. Nutrition education films and slide series can be obtained on loan or purchased on request to the Commission.

Nutrition and Public Health Planning

By DERRICK B. JELLIFFE and E. F. PATRICE JELLIFFE*

Malnutrition, as far as it belongs to the medical domain, is primarily a public-health problem. Prevention is better than care. For the cost of one hospital bed, many children could be prevented from becoming seriously ill. The main task is to define the priorities (as a result of community diagnosis), to devise adaptive programmes (especially of the "comprehensive mother- and child-health type") and to train staff (including para-auxiliaries and volunteers).

Rational public-health plans to assist in dealing with malnutrition can only be based on a "community diagnosis" of local forms of malnutrition, including their nature, dimensions and geographical location, the age-groups involved and the causes. This is a similar process to that of clinical diagnosis in classical medicine.

This information is needed to convince planners and administrators of the magnitude of the problems in human and in economic terms. It is needed to ensure the mobilization of limited resources for a rational programme geared to "*at-risk*" *areas* (with, for example, low-protein tuber staple foods), to *major problems* (for example, rickets in Ethiopia and kwashiorkor in southern Uganda), and to *vulnerable age-groups* (usually the second year), and to provide *base-line information* from which the effects of future developments, planned and accidental, may be measured.

Likewise, *an assessment of the actual and potential health resources* for dealing with problems of community nutrition needs to be made, including the type, location, function and coverage of existing health services, and the duties, inter-relationships and training of available cadres of staff.

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Methods of measurement

Community nutrition can often best be measured by surveys, which may be of greatly varying degrees of complexity and may be longitudinal or, more usually, cross-sectional.[2] They often include the examination of representative sections of the population for the clinical signs, biochemical laboratory tests and body measurements (anthropometry) considered to be indicative of malnutrition.

Statistics concerning the occurrence of the more easily identified forms of malnutrition may be sought for, while, in some circumstances, statistics on the mortality at certain ages known to be especially susceptible to malnutrition, such as the second year of life, are available.

Malnutrition of all forms, especially in young children, is always the result of a large number of different causes, as well as an inadequate diet. For example, infections, customs (old and newly acquired), poverty, and population considerations all may play a variable role from one area to another. An understanding of the responsible factors is needed for the particular region, and information needs to be collected on dietary patterns, on cultural practices, on the economic resources of families, and on "conditioning infections".

Assistance with the community diagnosis can be obtained not only from surveys but also from hospital and health-centre attendance figures and from the investigation of the *detailed causes of malnutrition* in such severe cases as are dealt with by the health services. However, plainly this data represents only those reaching the hospital or centre and is often still more misleading, because individuals, especially young children, frequently suffer from several conditions at one time, often including terminal infections on a background of unappreciated malnutrition.

The community diagnosis should ideally include assessment of many non-medical factors, such as food production, income, etc., and may be a complex procedure. However, *even with limited staff, funds and all other resources, considerable data can be acquired by means of rapid surveys (especially using anthropometry), combined with information from health centres (and from their adjacent "defined areas").*

Nutrition profiles in Africa

Despite great variation in very diverse ecologies, nutrition profiles in communities in Africa show a common theme, with *severe malnutrition mainly a problem in young children and in pregnant and lactating women.*

Protein–calorie malnutrition (PCM) of all grades of severity is the major nutritional public-health problem in young children, with *kwashiorkor* often the main severe syndrome in the "transitional" or weaning stage (especially in the second year of life), and with *nutritional marasmus* (associated with diarrhoea) in infants apparently becoming more frequent in peri-urban regions, because of a decline in breast feeding due to various factors, including mothers going out to work and the influence of the advertising of high-cost, commercial, infant foods, which can neither be afforded in adequate quantities nor prepared hygienically. All are related to the cumulative ill effects of incorrect diet, infections and other factors.

The size of the PCM problem is emphasized by survey results which have shown that up to two-thirds of the pre-school children are affected in many tropical communities. Anaemia is also common, again due to nutritional and infectious causes, including malaria and hookworm haemorrhage. Other forms of malnutrition, for example, avitaminosis A and rickets, are important in more localized regions.

Malnutrition in mothers is usually less dramatic, although anaemia may be significant. More usual is the "maternal depletion" due to the cumulative effects of too frequent, too closely spaced, pregnancy–lactation cycles, in some places associated with a culturally restricted diet and continuing hard work.

The interdependence of the nutrition of mother and baby is increasingly recognized as vital, not only for adequate foetal stores and successful lactation, but also because the survival of the infant is dependent on his having a live, healthy mother to feed and care for him in the early years of life.

The main features of the nutritional profile in most of Africa will, then, be a high rate of malnutrition, especially of PCM and of anaemia, in young children and pregnant women, reflected not only by the common occurrence of clinically recognizable illness and associated infections but also by high mortality rates.

Expressed in another way, the problems of maternal and child health (MCH) in Africa are the end-results of malnutrition × infection × hazardous, excessive, ill-supervised pregnancies. The magnitude of the situation is emphasized by the fact that young children and pregnant women make up at least half the population.

Adaptive programmes

Programmes to deal with malnutrition need to be adapted to local circumstances, that is, to the actual problems, to the geography, to the culture, to limited resources of staff and facilities, to poor road communications, and to other ecological circumstances.

A logical sequence is to *define priorities* (as a result of community diagnosis), to *devise adaptive programmes,* and to *train* appropriate forms of staff to man these services (including para-auxiliaries and volunteers), with special reference to practical work in rural and urban areas, to the team approach and to local priorities.

In fact, a different mechanism has been operative in many parts of Africa (and, indeed, in most of the world) until recently, in which centrally placed, clinically oriented, money-eating, prestigious hospitals have been the main aim, with little relation to economic feasibility, to predominantly rural population distributions or to major health problems, especially malnutrition in early childhood. Re-thinking of the roles of the different traditional components of the health services, including staff and hospitals, is under way everywhere, especially as recent evidence suggests that a point is often reached at which an over-crowded, understaffed, children's ward may be an expensive "lethal factor".

All over the world, it is being realized that adaptive programmes and services are needed, based on modern scientific knowledge but adapted to reach the majority of the population, in both rural and urban areas, with basic comprehensive health care that is geared to the priority problems, to the cultural and ecological background, and to the always limited budget.

Because of the concentration of nutritional problems in early childhood and in pregnant (and lactating) mothers, *the main emphasis will always need to be on adaptive MCH services,* within the framework of, and as a spearhead for, the basic general-health services. It is through

MCH services that practical nutrition and advice on child-spacing can flow more logically and effectively.

Such planned MCH services should aim at covering both treatment and prevention in mothers and young children, especially for recognized "at-risk" ages or groups, in villages, in health centres and in hospitals, as well as such other facilities as may be required, for example, nutrition rehabilitation units and day-care centres.

The basic components of such an MCH network need to cover[7] (i) *the improved feeding and care of mothers and young children* (with especial relation to locally available, traditional foods, including domestic "multi-mixes" and human milk, and consumer education in the purchase and use of processed infant foods); (ii) *the early recognition of malnutrition in mothers and young children* (by monitoring growth with serial weighing and the use of inexpensive weight graphs) *and by supplementary feeding* (when indicated and with whatever protein, vitamin or mineral supplements are locally appropriate); (iii) *prevention and early management of conditioning infections* (by immunization, using practical schedules adapted to local needs and logistic possibilities, and by appropriate anti-malarial chemoprophylaxis); (iv) *improved therapy of severe PCM* (in hospital, in health centres, in nutrition rehabilitation units or even in homes); and (v) *child-spacing* (using culturally acceptable, practicable techniques). Through all of these services, *health* (*and nutrition*) *education* must be a major theme, especially in traditionally clinical bastions, such as hospitals, and in all cases must be co-ordinated with the activities of other extension services, such as those in agriculture and in home economics.

The most useful network needs to be devised for the particular region or area. It needs to be culturally acceptable and financially feasible. Its activities should include the full range of health promotion, prevention and therapy. It should aim at as full a geographical coverage as possible. It should be comprehensive in aim but "at-risk" in focus.

The hospital, as such, must have a modified function (for example, the mothers must be admitted and there must be a model house and "low effort garden" adjacent) and must play a different clinical role than previously, concentrating perhaps on rapid admissions for special therapy, such as blood transfusions and special investigations, such as radiology. Re-allocation of resources is needed away from the expensive doctor–hospital dominance to less costly, more disseminated, rural units manned

by auxiliaries. This is a world trend, also involving the industrialised countries.

The basis of the service will most usually be a form of health centre, often with some unpretentious accommodation. Both in hospital and in the health centre, the "*young-child clinic*" (or "*under-5 clinic*") will be the main service dealing with malnutrition.[6] These clinics can be either *static* or *mobile*. They use little equipment and can be accommodated in a loaned house or under a tree or simple shelter. When practicable, they should be associated with some form of home-visting, at least of some "at-risk families".

The number of maladies seen in young children is usually limited to about 10, dominated by malnutrition, and, provided a system of supervision and referral can be devised, these clinics can be most successfully managed by specially trained auxiliary staff and village volunteers.

A "line-in flow" needs to be devised for such clinics, often with the following type of sequence: registration, weighing, practical health education (demonstration with involvement), examination and individual counselling, immunization, and issue of such food supplements and medicines as are required. Guidelines are needed for the local organization of such clinics, for training staff and for changes that may be introduced with experience or the development of new circumstances.

In addition to "modified traditional" MCH components of national nutrition networks, it is also necessary to consider the place and role of relatively newer concepts, such as *day-care centres* (especially in urban areas) and *nutrition rehabilitation units* (usually for the management of less advanced cases and for the practical education of mothers by actual involvement in the feeding of their own children).

Organization

The main need is to persuade those in authority to make decisions—senior administrators, planners and politicians. This needs valid evidence of an unemotional and convincing nature of the human and economic cost of malnutrition, and the logical and money-saving approach of a national preventive program. Fortunately, such data are available, for example, from Ilesha in western Nigeria,[6] and elsewhere.[4]

Likewise, the modernness and scientific validity of such an approach needs stressing, including the recent research on human milk,[3] village-

level multimixes (such as high-protein weaning foods),[1, 5] the use of growth charts,[6] etc.

Once this fact is accepted, a program to combat malnutrition can obviously best be viewed as an inter-disciplinary, inter-sectoral matter, to be undertaken collaboratively by the various ministries and other groups concerned with food production, with trade policy and with all forms of education, both general and technical. Appropriate mechanisms then need to be evolved that are more likely to lead to viable co-ordination in the particular country.

Even within the area customarily encompassed by the Ministry of Health, difficulties occur because of the diffuse nature of "nutrition", overlapping, as it does, with health education, with family-planning, with statistics, and with the development of MCH services, and being, as it is, an important part of the basic health services.

In view of the importance of malnutrition in most African countries, there is always a need for direction, technical guidance and expertise in nutrition at a high level, often in the form of a nutrition officer (and unit), preferably with a status equivalent to that of a deputy or assistant director. In large countries, regional officers are indicated, together with a food and nutrition institute (preferably with an interdisciplinary approach).

Important functions of these units are to undertake the initial "community diagnosis", whether of a simple or more complex nature, to advise on the development and supervision of suitable adaptive services, and to ensure continuing monitoring of nutritional status (by the notification of identifiable forms of malnutrition, such as kwashiorkor, and by the recording of children with different degrees of underweight in hospital wards and at autopsy).

Also, within both the administrative and the functional framework, it is necessary to try to ensure practical, workable and amicable liaison in the health field, between, for example, those concerned with nutrition, with maternal and child health, with health education, with statistics, with family-planning and other relevant departments. In fact, even before the overwhelming need for collaboration with agencies concerned with the "non-health" aspects of food and nutrition, such as planning, trade, agriculture, education and community development, it is necessary to ensure profitable and harmonious liaison *in the health field itself*. Co-ordination, like charity, begins (or should begin) at home.

Conclusion

The main need is not finance but imagination and the ability to devise innovative, low-cost applications of newer scientific knowledge—to achieve *functions* rather than ritually formalized categories of worker and ossified classical units, without relevance to local circumstances or resources.

Blocks to this imaginative quantum jump include the tangible, political prestige of hospital-based, medical technology, the conservatism of the medical establishment and the recently aroused expectations of the population, unfortunately motivated to consider medical advance and prestige in relation to ultra-diagnosis and modern technology rather than the real but difficult goal of applying science simply, practically and economically for the good of the majority.

References

1. Cameron, M., and Hofvander, Y.: *Manual on Child Feeding.* Protein Advisory Group (PAG) of the United Nations, 1972.
2. Jelliffe, D. B.: *The Assessment of the Nutritional Status of the Community.* WHO Monograph No. 53. Geneva, 1966.
3. Jelliffe, D. B., and Jelliffe, E. F. P. (eds.): The Uniqueness of Human Milk. *Amer. J. Clin Nutr.* 1971: 24, 968.
4. Jelliffe, D. B., and Jelliffe, E. F. P. (eds.): *Nutrition Programs for Preschool Children.* Proceedings of a Conference, Zagreb, August 1971.
5. Jelliffe, E. F. P.: A New Look at Multimixes in the Caribbean. *J. trop. Pediat.* 1971: 17, 135. Monograph No. 16.
6. Morley, D.: A Medical Service for Children under Five Years of Age in West Africa. *Trans. Roy. Soc. trop. Med. Hyg.* 1963: 57, 79.
7. Williams, C. D., and Jelliffe, D. B.: *Mother and Child Health: Delivering the Services.* Oxford University Press, London, 1972.

Part III
The Necessity of Integration

Few of the participants in the seminar doubted the necessity of integrating the wide variety of factors which together influence nutrition into a comprehensive national nutrition policy, but there was considerable discussion on how to do this and to what extent it was possible.

The papers in this section reflect that situation. Economists and planners do not always find that nutrition has made out its case. Politicians and officials are confronted with other priorities. It is necessary to start integration at the national planning level.

Nutrition as a Priority in National Development

By F. T. SAI*

The seriousness of the nutrition problems in the countries of Black Africa is rarely fully appreciated by the governments. Reliable facts about the morbidity and mortality due to malnutrition are non-existent, as far as national figures are concerned. In political terms, the groups mostly affected have no great voice. There is a need for inter-ministerial nutrition commissions, but such commissions will prove effective only if they have secretaries who are highly trained nutritionists and have access to efficient research units.

The overall goals of all national development programmes are to make adequate provision for supplying the basic needs of the society, namely, good food, good health, adequate housing, education and employment opportunities. The extent to which some of these goals have been attained is one of the criteria distinguishing the developing countries from the more developed ones.

Nowhere in Africa south of the Sahara or Black Africa, as we now call it, have any of these goals been reasonably attained. In all of the African countries, poverty, illiteracy, poor housing and lack of employment opportunities are the lot of the majority. The problems created by transferring advanced technology to countries and cultural situations not completely prepared for their reception tend to make more difficult the attainment of some of these goals, including that of feeding the populations. In the majority of African countries, the problems relating to food and nutrition are very serious. There is no country in Africa south of the Sahara whose people have attained, on the average, a level of nutrition commensurate with good growth and development, good health and satisfactory working efficiency.

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Until relatively recently, however, the serious constraints that defective nutrition places on the attainment of rapid development had not been fully realised, and even now most countries do not appear to give nutrition the priority it deserves. The reasons for this are many, and the fact is that the total resources available for all development are so scanty as to make planners place their emphasis on programmes which will yield quick and economically and politically impressive returns. It is also true, however, that the seriousness of the nutrition problems is not appreciated, even in gross terms.

Most countries readily understand famines or periodic food shortages, whether generalised or localised, and make emergency provision for them. There is also some appreciation of chronic calorie shortages, though little is actively done about it. However, the importance of specific nutrient deficiencies and the havoc that malnutrition plays with lives of the vulnerable groups, such as children, pregnant and nursing women and some special working groups, is hardly appreciated.

In political terms, the groups mostly affected have no great voice. Nor indeed do they usually recognise it as a problem to be tackled by the national governments. Governments and people alike equate adequacy of energy-giving foods with adequacy of nutrition. Perhaps the tendency in the past for ministries of health to have the sole or sometimes the major responsibility for nutrition programmes is also responsible for the low priority rating accorded to the subject. Nutrition is made to compete for funds with programmes for curing the sick and for controlling the more obvious communicable diseases—programmes which are always easier to appreciate.

Food production, which is the basis of all nutrition, is not properly organised in many countries. It does not have the governmental support it deserves, since the foreign-exchange-earning cash crops are more attractive. The problem itself is so complex and needs inputs from so many agencies and organisations that realistic plans are often difficult to evolve.

Before any subject can be considered a priority one, its importance must be demonstrated to the national policy-makers. They should also be made aware of the possible consequences of not finding solutions. For food and nutrition, there are many direct and indirect indices which may be used for demonstrating what is happening among the population.

Demographic considerations

The size of the population, its age and sex distribution and its rate of natural increase are of great importance. In most of Africa, the population is increasing very rapidly at a rate of about 2.5% per annum. Food production has not been keeping pace with this natural rate of growth, so the gap between the population and its food supply is increasing. There is a high fertility rate, meaning that a large proportion of the women are either pregnant or nursing at any given time, thus increasing their demand for food. The average woman in Ghana has 6–7 pregnancies during her fertile life. Twenty per cent of the population are under 5 years old and up to almost 50% under 15. The young group, with proportionately higher food requirements, are non-contributors to its supply, and the greater their numbers, the more the food resources are strained. There is a very rapid migration of young able-bodied adults to the towns in search of jobs and improved social status. The main urban centres in Africa are growing at rates of 7–12% per annum. These youths are leaving the farms and joining the ranks of the food-buyers. Many remain unemployed for prolonged periods and their nutrition, as well as that of their children, suffers. The seriousness of the nutrition problems of such migrant groups have been stressed by many writers. Their nutritional status and that of their dependents are largely related to their earning power.

Growth and development

The growth and development of children is a good index of national nutritional status and can be used to demonstrate differences between regions, groups and classes of the same country. It is known that the children of poorly fed mothers are smaller at birth than those of the adequately fed. Low birth weight itself is associated with inability to thrive and higher neonatal mortality. The children are generally breast fed and those who escape death during the first few weeks do very well up to 6 months or so. Comparative graphs of African and European children during the first 6 months show a very satisfactory growth performance. From 6 months onwards, the African children lag behind and by 2 years of age there is quite a divergence. It is from the age of about 6 months that supplementary foods should enter the child's diet.

These foods are not adequate in quality and quantity and the growth rate reflects this quite well.

Among Africans themselves, there are differences between the growth rates of children of the well-off elite classes and those of the poorer classes which can be used to demonstrate the importance of good nutrition.

Regional differences are also important. The children of the drier sub-Sahara zones are generally thinner for their age and height than those of the coastal zones. The adults are usually tall and thin and their weight-to-height ratio is less satisfactory than that of Africans in the forest and coastal belts.

The weight of adults is a fairly sensitive index of their current nutritional state. Research work in Africa has demonstrated that adults in the sub-Sahara regions may lose as much as 5 lbs in weight during the pre-harvest period known as "the hungry season". This weight is regained immediately after the harvest. Such fluctuations in weight cannot be good for maximum productivity.

Morbidity and mortality

The facts about morbidity and mortality directly attributable to malnutrition would be the best possible guide to the extent to which malnutrition is a serious national problem. Unfortunately, in none of the countries are such facts available. Where they exist, they are hardly reliable, because of the many known faults in the collection of such facts in developing countries. Although overt malnutrition is easy enough to diagnose, there are many gradations between the normal and the diseased which make agreement on a cut-off point quite difficult. Where surveys have been used to collect the facts, sampling errors have not always been avoided and most African nations which have such data cannot really depend on them for planning and evaluation. It is, however, necessary to stress that morbidity and mortality statistics are extremely valuable.

In terms of morbidity, the extent to which malnutrition is a problem in a national sense is demonstrated by the annual incidence of cases of the major nutritional disorders prevalent in the country. For many African countries, protein–calorie malnutrition (kwashiorkor and marasmus) may be taken as an example. Because of the shortage of health

facilities and the fewness of health staff, as well as many other factors that make for poor utilisation of health services, the returns from hospitals and clinics of illness due to malnutrition contain gross underestimates. In statistical terms, they are not useful, as the susceptible population itself is usually unknown. It is very clear, though, that protein–calorie malnutrition (PCM) is a serious disease of children between the ages of 6 months and 4 years. By surveys, some idea of the point prevalence of the disease (the number of cases existing in the community at any given time) can be gained. In Africa, figures ranging from 2 to 10% have been found for overt or clinical cases. In other words, with 20% of the population under 5, it is quite likely that as many as 2% of the total population have signs and symptoms of PCM at any given time. For a country of the size of Ghana, that is, 8.5 million people, this means that a total of 172 000 children are afflicted at any given time. It is well known that the clinical cases are just a fraction of the total number of cases requiring attention. If growth retardation of a severe enough degree is considered the main criterion for diagnosis, then in much of Black Africa some 40 to 50% are deficient at any given point in time. It is such terrifying statistics that have to be put before the national policy-makers to enable them to assess critically the importance of malnutrition. But nutritional deficiency is also an underlying cause of many diseases and aggravates others. The fact that malnutrition and infection act synergistically has been documented extensively, so that, apart from the illnesses directly due to malnutrition, others, such as severe diarrhoea and bronchopneumonia, may be indirect indicators of the nutritional state.

It is only recently that PCM by itself has been considered a major cause of death and so too much reliance cannot be placed on registration figures. However, if one selects groups of diseases known to be associated with PCM, then a reasonable estimate can be made, provided the basic figures are accurate. It is known that untreated kwashiorkor carries a mortality of 50% and that with treatment this figure comes down to 10–20%. From the prevalence rates and these figures, a reasonable estimate of the lethality of these diseases can be made. If 172 000 Ghanaian children are affected at any given time and 20% are doomed to die, it means that 24 000 children are dying from a disease which ought not exist at all in the 20th century, because its cause and control are known.

So far, no mention has been made of the cost of treating PCM. With the inadequate health facilities that exist, no more than a very tiny fraction of those affected receive any treatment. In Accra, we estimate that we treat about 500 overt cases a year; at 240 dollars per case this works out at 120 000 US dollars per year. If the rest of the country treated another 500 cases, the total cost would be 240 000 dollars. This is an amount of money that could be usefully spent in mounting preventive programmes.

Quite apart from the inadequate coverage and the high mortality, even among those treated, there is the whole group of nutritional cripples and mere survivors, as someone has described those who recover from PCM. They are stunted in growth, both physically and perhaps mentally.

Apart from these very direct indicators, there are many indirect indicators of poor nutrition. Since PCM is most lethal in the second year of life, the death rate at this period is important. The so-called toddler-mortality index, i.e. the ratio of the death rate of children aged 1 to 4 in relation to the infant-mortality rate, is a good general guide to the importance of nutrition, but it is not now considered specific enough. The prematurity rate is a reflection of poor maternal nutrition. The rates for Europe and America are around 4%, while those for the poorer Africans are about 25%. The elite Africans show prematurity rates which are no different from those of Europeans.

Among women, the best indication of poor nutrition is obtained during pregnancy and the lactation period. Most women in Africa do not gain weight commensurate with the needs of pregnancy. Some actually lose weight during lactation; these women may therefore be milking the flesh off their bodies for their children. This leads to premature ageing, which, coupled with frequent unplanned pregnancies, also leads to high maternal mortality.

Every country depends on its working groups for its economic progress and it is almost axiomatic that a hungry nation cannot achieve its full potential. The actual evidence for this statement in Africa is not very impressive and more must be obtained. The productivity of agricultural and other work in Africa is comparatively low. The African labourer is not capable of prolonged sustained effort. Both of these facts have been attributed to poor nutrition. In the Gambia, Fox found that agricultural workers had an energy output which almost matched

their calorie intake. This means that the workers economised their energy output to keep within their calorie input.

It might be argued from this that an increased calorie intake should therefore lead to an increased output and that, if this did not happen, then the restricted output is not solely or even mainly due to calorie deficiency. But this line of argument ignores the known fact that the productivity of labour is influenced to a considerable extent by educational and psychological factors, which are more deeply engrained than the lack of food. Merely increasing food for an adult labour group may not increase output. What happens when food intake is further restricted is much more important. I believe that any experiments which cut down the food intake of labourers will show reduced productivity, perhaps immediately.

In Accra and many other parts of Ghana, labourers go to work on an empty stomach and have their breakfast at mid-morning. Their rate and efficiency of work declines quite appreciably before breakfast. In other countries, it has been noticed that providing breakfast for a work force or school children makes for better work output and cuts down absenteeism.

All the above-mentioned factors serve to illustrate that the problem of nutrition is a serious one at the national level. However, a problem does not get a priority rating simply because it affects a large number of people by causing diseases or by sapping strength. The opportunities for solving the problem must be actually or potentially available. To quote an example from medicine in Africa, let me present the case of yaws.

Yaws was a common disease in Africa, affecting a large number of people, both young and old, and causing much disfigurement. It was not a very lethal disease. It certainly did not compare with malaria as a cause of morbidity and mortality. However, as soon as penicillin proved its efficacy against yaws, practically all the African nations undertook to fight against it. In a few years, yaws was completely wiped out from many parts of the continent. The problem with nutrition is that it does not lend itself to one-shot solutions and its complexity tends to discourage any efforts at all.

It must be stated at this stage too that there are certain things in life which are not quantifiable in economic terms. After making valiant efforts to justify nutrition being given priority by economic arguments,

the humanitarian arguments should not be forgotten. What price happiness? How much do smiles and laughter in a home where the children are living happily and growing well mean to a nation? What is the negative effect of unhappiness, however caused? No one knows, but these things should be considered.

For nutrition to be given a high priority in national economic-development programmes, therefore, several important factors must be considered.

1. *Food production and distribution.* The staple foods produced in Africa belong to two main groups: the cereals and the starchy roots and fruits. Millets, sorghums and maize are the main cereals, and these millets and sorghums have very good food value, as reference to their nutrient compositions would indicate. Maize is not as good as the others. The starchy fruits and roots include cassava, yams, plantains and several types of bananas. These are bulky to transport and have poor food value. About 60% or more of their bulk is water.

Problems of transportation and storage hinder the proper distribution of food and it is a well-known fact that food may be rotting in some parts of a country, while near-famine exists in other parts. Food-processing, which is a major tool for regulating the availability of food, is really in its infancy in Africa. There are also distribution problems within the family itself, because the special needs of physiological groups are not understood by many. There is much lack of knowledge at all levels about the quality aspects of food and economic planners are no exception. Everywhere some small concessions are made to the production of the basic staple foods, but little attention is paid to the foods that give quality proteins, vitamins and minerals.

Food production in Africa is still in the hands of peasant farmers and is largely subsistence production. This must be changed and the food-crop farmer must be made to see the economic usefulness to himself and his family of his efforts.

2. *The unavailability of trained personnel.* This is at once a cause of the poor appreciation of the importance of malnutrition as well as a reason for not doing anything actively about it. It is the trained personnel who would get the facts with which to educate the policy-makers,

as well as help to develop and execute the nutrition programmes. In Africa, therefore, one way of bringing nutrition to the level of priority it deserves is to train rapidly all cadres of nutrition workers. Doctors and high-level biological scientists, including agriculturists, as well as ordinary graduates in related fields, need to be given organised courses that will make them understand their roles in nutrition activities. There are many levels of auxiliary staff in health, agriculture and community development who are indirectly working in nutrition and these should receive appropriate training too.

3. *Cost of programmes for nutritional improvement.* Probably no single factor assists the priority rating of a programme as much as the availability of funds. Unfortunately, in most of Africa funds are very short and the demands are great. It must, therefore, be demonstrated that a properly planned programme for improving nutrition will generate some kind of economic return and provide jobs. Good programmes will, first of all, provide import substitutes. They should provide the basis for adequate, balanced diets at reasonable prices and they should improve the earning power of food producers. If these things can be demonstrated, nutrition may receive adequate priority.

4. *Socio-cultural factors.* The importance of the social and cultural factors that underlie the nutrition problems discussed earlier must be recognised. The food practices and preferences, as well as the food habits *in toto,* are important. Solutions will depend on the extent to which these practices can be changed or be harnessed for a good end. It must be stated here that a misconception that Africans are resistant to change in this respect is partly responsible for the low priority rating of nutrition in many countries. Africans are no more resistant to changing their food habits than others. The increased consumption of rice, flour and soft drinks is a case in point.

How can we get all this across to the economic planners and the government?

There is no single definite approach by which governments may be made aware of what priority nutrition demands, and therefore the most immediately feasible is the correct one. Individuals who are respected

and have contacts with ministers of state may be made aware first, so that they can convince the ministers. Wives and friends of ministers of state may be involved. It is not necessary to get only those ministers who have direct responsibility, such as ministers of health or agriculture, since they may not be either powerful or vocal enough in governmental circles. Any powerful minister or even the secretary of the ruling political party may be the right person to convince before the government may be ready to listen and take action.

It is necessary to have at the highest possible governmental level some form of machinery to keep the nutrition problems under constant review, to suggest solutions and to plan programmes and activities. Owing to the complex nature of nutrition programmes, inter-ministerial nutrition committees or commissions have been tried in many places. Theoretically, this is a sound approach, but in practice they have not worked too well in many African countries. Their unsatisfactory performance may be due to lack of trained personnel, lack of funds, and inability to identify satisfactory projects which can be seen as politically and economically advantageous. To establish a nutrition commission when there is no highly trained nutritionist with a functioning research unit around him is unlikely to yield any satisfactory results.

If there is such an individual and such a unit, then he should be the secretary of the nutrition commission and his unit should provide the service secretariat. The commission itself may consist of the heads of the ministries of agriculture, health, education, community or rural development and economic planning. It is useful to add members from university departments of food science and nutrition or the food and nutrition research institutes. The major women's organisations may be represented, as well as individuals known for their standing in the society and interest in the subject. A total membership of about 15 is usually satisfactory, since the commission will establish standing committees which will include persons who are not necessarily members of the commission itself.

Priority programmes

The causes of malnutrition are very varied and complex and therefore a discussion of programme priorities in a paper like this may not be a very useful exercise. Although the reason for the presence of PCM

is that the right type and quantity of food is not getting into a body that needs it, the reasons for such a situation may be (*a*) non-availability of the foods, (*b*) lack of cash to purchase foods, (*c*) lack of knowledge about the right foods, (*d*) poor preparation, involving unnecessary loss and waste of nutrients, and (*e*) illness preventing the child from eating and many other causes.

Programmes to correct nutrition problems may therefore be geared to food-production processing and distribution, if the food-supply situation is considered critical in a given country or region. In other situations, more direct programmes of supplementary feeding and education of mothers may be indicated. Any of these may be combined with action to improve the environment, to provide water and sanitation facilities and to reduce the burden of childhood infections. The annex to UN Resolution A/RES/2848 (XXVI) on protein resources gives a useful general list of priorities, which may be quoted here.

Essential elements of the Strategy Statement on Action to Avert the Protein Crisis in the Developing Countries

1. Make every effort to increase the production of food crops, particularly through the exploitation of new high-yield varieties, bearing in mind the special need for an expanded production of protein-rich pulses and oilseeds;

2. Encourage accelerated and expanded research designed to improve the nutritive value of cereal proteins through genetic engineering;

3. Encourage accelerated and expanded research designed to develop high-yielding pulses, legumes and oilseed crops;

4. Encourage the increased production of animal proteins, particularly through research on increasing forage yields and production;

5. Make every effort to prevent an unnecessary loss of protein-containing foods in field, storage, transport and home;

6. Encourage increased production from marine and fresh-water fishery resources;

7. Encourage the development, distribution and promotion of formulated protein foods;

8. Facilitate the application of science and technology to the development of new protein sources, in order to supplement conventional food resources;

9. Develop and support regional and national centres for research

and training in agricultural technology, food science, food technology and nutrition;

10. Conduct informational and educational campaigns related to protein production and consumption;

11. Improve protein utilization through the control and prevention of infectious diseases;

12. Review and improve policies, legislation and regulations regarding all aspects of food and protein production, processing and marketing, so as to remove unnecessary obstacles and encourage appropriate activities;

13. Give special attention to the protein needs of vulnerable groups;

14. Initiate intervention programmes aimed at ensuring that vulnerable groups will receive the most appropriate type and a sufficient quantity of food by the most effective means;

15. Recognize the important relationships between family size, population growth and the protein problem;

16. Recognize the role of economic development and social modernization in solving the protein problem.

Conclusion

There is not much doubt that nutrition is a grave problem for African development. Its true extent is not really known, but, in gross terms, it must rank as one of the greatest causes of disease and death. The impact is mainly on the pre-school child and the pregnant and lactating women. These are groups which are not very vocal politically and whose problems therefore do not gain the attention they deserve. With increasing evidence that malnutrition during foetal and early life may impair mental development, governments need to give a much higher rating to the solution of national nutrition problems.

An Economist's View of Nutrition in its Struggle for Budgetary Priority

By KURT M. SAVOSNICK*

One of the reasons why applied nutrition programmes have had at best modest success in developing countries is the reluctance of many ministries of finance to allocate funds for this purpose without a convincing cost–benefit analysis. Systematic research in the field of "nutro-economy" is only now beginning to take shape. The following contribution by a hard-boiled economic adviser to an African ministry of finance shows what the "nutro-economists" may be up against.

It appears that I am the only contributor to this seminar who has never had anything to do with nutrition, and the reader may therefore well ask why I should be included if this is the case. The reason is quite simple; in every country, nutritionists will now and then come up against people who are, above all, *planners and resource allocators,* usually in the ministries of finance and planning, and who are in a difficult position. They have limited knowledge of the peculiarities of any particular subject or cause and they do not easily enthuse about whatever special cause you are pleading. On the one hand, they have to strike an annual balance between a number of "established" causes, such as funds for agriculture, industry, education, health, roads and other infra-structure and all the usual topics which figure in our budgets. On the other hand, they have to be convinced that a *new topic,* such as nutrition, deserves to be taken so seriously that it must be allowed to make budgetary inroads among the many and varied allocations which have already established their places in a crowded list.

The usual way of allocating money in almost any Government is to look at last year's budget and see what each ministry got for its different

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pet projects and programmes and perhaps also to look at a sequence of a couple of years to see how the spending actually developed. Some ministries invariably fail to implement or to spend fully within the budgetary allocations for particular programmes, and the normal result of such failures is that their fresh demands for the coming financial year are looked at rather critically. Other ministries have a tendency to exceed their allocations and, while this is very naughty, they have at least shown that they are capable of spending money!

Then there is the occasional ministry which just keeps within its vote and behaves as a good ministry should but which may nevertheless have had the misfortune to underspend on certain programmes or projects and overspend on others. All these claimants now appear again in the Ministry of Finance for the annual budget exercise (or in the Ministry of Planning, if it happens to be the time for one of those periodic upheavals which are called "new development plans"). Usually they *all* ask for "much more money than last time" and since they are incapable of agreeing among themselves, it falls to the ministry in charge of central resource allocation to strike some sort of balance. This may very well be an *economic* balance, if the country is run by technocrats, or a *political* balance, if it is run by politicians, and usually it is some mixture of economics, politics and *administrative convenience.*

The latter is quite important if the people engaged in the central resource allocation are neither economists nor politicians; nothing is easier than to look at the budgets of preceding years and the records of actual expenditure and then to apply some kind of rule of thumb, whereby each ministry's allocation for the new period is scaled up by a standard percentage. Ministries which have shown themselves dynamic in the past may get a little more than the standard percentage and the notorious under-spenders will get less. However, it all comes out in the wash, so that the Minister of Finance can produce a budget within the total available resources of the country, taking into account the expected economic growth and the amount of loans and gifts which can be expected from friendly donors.

An important factor in this administrative-cum-economic-cum-political process is that the allocations to ministries, programmes and projects are often made by officials who have very limited knowledge of the costs and benefits of each item but who all have a considerable experience of the extravagant claims which are made by certain

ministries and by certain officials, when they try to sell their ideas to the Treasury.

Perhaps it may be thought that I am giving an exaggerated and jaundiced view of the budget and resource-allocation process, coloured by cynicism and prejudice. Perhaps that is so. There must be some countries where the balancing acts are carried out by eminently knowledgeable and skilful men who not only know full well what the economy can afford but who also have very clear ideas of what each programme and project will contribute in the short run and in the long run to the welfare of the people. They are men who can justify their allocations in confrontations with colleagues from "operating ministries", who are equally reasonable and skilful men who would never dream of making exaggerated claims for pet projects and who have a very clear idea of what *their* ministry is capable of performing during the coming year. They will not only refrain from asking for money which will remain unspent (to the detriment of other ministries) but will also refrain from asking for money for badly written-up projects. Let me say that there *must* be some such countries and that we will all be working in them one day.

Meanwhile, we have the less-than-perfect reality of government and resource allocation as we know it, and into this reality there now intrudes a new claimant for resources, namely, *nutrition*. Good luck to it, and more power to the elbows of the people who push it. But how does it fit in with the existing claims? There will undoubtedly be persons who will say that nutrition is so terribly important and that the ignorance of the government at large is so enormous that *any* means are permissible which will result in the allocation of more funds for nutrition programmes. If you can beg, borrow or steel money from the Treasury by whatever means, you *know* that it will be well spent and you also *know* that whatever other ministries will lack money for, as a result of your successful raid on the Treasury, is both comparatively and absolutely unimportant. Well, if this is how you feel, you do not need to listen to anybody talking about the economics *of* nutrition, nor about economics *and* nutrition. You already know the answers, and your only real interest, beyond nutrition itself, is to find out whether there are any good arguments that you may have overlooked. What you need in that case is a public-relations consultant or a psychologist who has specialised in the make-up of Treasury officials.

The fact is that there is now a certain kind of missionary fervour in the nutrition field, because some people have just "discovered" nutrition and consider that everybody else is ignorant. Let us, however, look at nutrition somewhat more closely and recognise, once and for all, that nutrition *is* essential but that there are a number of other claims on national resources which are *equally* essential, and that in critical situations a nation may have to give priority to many items before nutrition. Let us also agree that, within the field of nutrition itself, there are some programmes and projects which are more important than others, so that, in the final bargaining in the budget process, there are some nutrition programmes which can perhaps be sacrificed rather than others.

Some people will say, proudly, "economics is not everything", as if that were a good argument when the proper place of nutrition is being discussed. It is quite obvious that there are certain things which can be done in a society, in *any* society, which are not only wholly good but which can also be carried out without detriment to any other activity. *Kindness* and *loving your neighbour* are certainly such things, on the personal level. On the national level, one must in all honesty recognise that kindness sometimes costs money and that there may conceivably be a conflict between, say, *kindness* and *economic growth*. A slowdown in the economic growth of the poor countries will, however, result in more misery than otherwise and if it is accepted that rapid economic growth will hasten the day when misery can be reduced by affluence, then it is clear that there is a genuine choice between misery today and misery tomorrow.

It is on the basis of some such reasoning as the above that nutritionists have an interest in economics. It is clear beyond the slightest doubt that malnutrition causes misery and suffering, and it is also clear that some forms of malnutrition are more pernicious than others. It is possible and likely that some forms of malnutrition will have considerable after-effects later in life and will influence the well-being and productivity of the people for generations. This is where a powerful economic argument enters into the nutrition issue; an injection of costs, at a critical phase of a young person's life, in order to improve his nutrition at that stage, will or may have an effect on the same person's physical productivity later in life. Alan Berg and Robert Muscat have tried to present a case with rather hypothetical values for "present

costs" and "future benefits" which is very interesting; if their calculations are valid, they will have a good case for altering the resource allocation in society not only on humanitarian grounds (today) but also on economic grounds (weighing today's costs against tomorrow's benefits). This is how it should be done and, if they show that there will be an economic return on capital invested of, say, 10% per year, they can effectively argue with Treasury officials that the latter should *not* spend money on any other projects which give a return of less than 10% per year, as long as the nutritionists have a 10% return on their operations! It may be admitted that economics can be useful in nutrition; the demand which then arises is naturally that the economic arguments which are advanced in favour of expenditure on nutrition shall be unassailable. That, unfortunately, requires a lot of homework and a lot of restraint on the part of the nutritionist. For example, something which at best is an *hypothesis* cannot or should not be put forward as a *fact*. One of the problems with nutrition today is that it is such a young science that a number of hypotheses have not had time to be fully tested. Better child nutrition means improved capacity for manual work and improved intellectual performance, but it has not yet been possible to translate these values into exact economic terms.

It is therefore essential to emphasise that many of the productivity assumptions made by nutritionists are assumptions and not facts. They may be conservative and reasonable assumptions, and should therefore convince sceptical Treasury officials that their current resource allocation ought to be improved. But they should *not* be stated as facts. All that can be said today is that we need to improve our statistics so that hypotheses can be transformed into facts.

Another tricky problem in the economics of nutrition which is now topical has to do with the problem of employment or unemployment. A great number of developing countries in Africa have terrific unemployment problems and will in all probability continue to have them for several generations. There is a lot of disagreement regarding the means of tackling this unemployment (which is almost invariably combined with malnutrition of the unemployed workers and their children). But, by and large, economists all over the world are agreed that, if the developing countries had *more* capital resources, more equipment and machinery and infrastructure, they would more easily be able to compete in the modern world, and would be able to employ more people than

otherwise. In other words, a country with 10 million people and a large stock of capital would be better off than if it had less capital, not only from a total output point of view but also from an employment view. Let us now assume that a nutrition programme is undertaken at the expense of capital formation, in other words, that nutrition is regarded as an investment. We would then have an improvement in the physical productivity and the brain power of the workers who were better nourished in the Alan Berg model. On the basis of calculations for a single individual, it might well be argued that the return on the investment is the equivalent of 10% per annum.

But if the economy we are talking about emerges with better-nourished, more intelligent and more productive workers but with a smaller capital stock of machinery and equipment, it is *conceivable* and *possible* that the number of unemployed will increase. I do *not* say that it is *likely* that this will happen, only that it is possible, and this difference is important. It is also possible, in some economies, that the increase in the physical productivity of human beings will outweigh the economic effects of a reduction in capital formation, so that the total output of the whole nation will increase as the result of a nutrition programme instigated 10 or 15 years earlier.

If and when this happens, i.e. when the *total output* becomes greater than otherwise, even if unemployment increases, it becomes a matter of income distribution to ensure that the unemployed in that generation will also be able to nourish themselves and their children as well as the lucky, employed ones.

What I mean is this. There is a great difference between calculations for an individual worker, showing that an improvement in his nutrition in childhood will improve his *own* personal output and income later in life, and a generalisation about all the people. Readers who are not economists will feel at this stage that the issue is becoming unnecessarily complicated; the fact remains that a nutrition policy based on economic reasoning has to be *complete.* It has to deal with the effects on the employed worker but it also has to deal with the effects on the unemployed and also with the effects on employment, with the income-distribution policies which can be assumed. A programme to ensure *satisfactory* nutrition levels for the whole of the present generation might wipe out so much capital formation that, with a 3% annual population increase, the next generation might have less capital per

person than the present or only fractionally more than now. The calculations will obviously differ from country to country, but it is obvious that a massive all-or-nothing nutrition programme will require rather careful calculations of the productivity of capital and the productivity of labour on a macro-scale before one could take the plunge and be sure that the people will be better off not only at the present but also in the future. This is, after all, what the economics of nutrition is about.

It may be argued that nutrition costs should not be set against other investments but against the current consumption of less essential things—transistor radios, private cars, television stations and receivers and similar luxuries—which a nation and an individual should not spend money on until the children and the adults have been adequately fed. With this argument there can be no quarrel—it is a matter of educating the nation and the individuals to desire the right things. But the economics of nutrition as a controversial issue seem to hinge on the desire to regard nutrition as investment; to the extent that this is the case, the arguments must be correct and the distinction between fact and hypothesis remains. In this context it remains a fact, and not an hypothesis, that rich people are generally better nourished than poor people. Therefore, an accelerated economic growth will enable future generations to spend much more on food than now, and still devote an increasing proportion of their income to other things than pure sustenance. This is the reality against which some current nutritionist arguments have to be judged. Economics may not be everything, but economic growth means that people can afford better food!

One argument for nutrition policies which has been advanced recently is that better nutrition will reduce the population explosion. If this claim were true, it would certainly be a very strong argument for a reorientation of Treasury policies. The argument runs as follows: a lot of children die because of malnutrition, and parents therefore have a strong incentive to breed many children, so that they can be sure that *some* survive and can look after their parents in their old age. Therefore, if parents understand that improved nutrition reduces child mortality, they will breed fewer children. Therefore the population growth will be reduced.

This argument needs some further comments. First, superficially it may seem that the difference from the present situation will be nil,

since the *number* of survivors will be the same in either case. However, it must be observed that the *quality* of children who have been reared in smaller numbers under more favourable nutritional conditions will be superior, thus also giving rise to healthier adults in the next generation.

Secondly, in the world as we know it, the information feedback to parents (that better nutrition ensures better survival rates) must take some time to percolate. Therefore, until parents have experienced the improved survival rates, they will not reduce their breeding rates. Therefore, the initial effect of improved nutrition is most likely to be an *acceleration* of population growth. This fact should be stated honestly and clearly, in order not to raise unrealistic expectations of immediate and rapid reductions of birth rates. However, as far as birth control through an improved standard of living (including better nutrition) is concerned, the acceleration must be looked upon as an inevitable phase of development and the longer it is delayed, the more severe the effects will be, calculated in absolute figures.

The strongest argument that can be put up to the Treasury for an increased budgetary allocation to nutrition programmes seems to me to be the following. If the Ministry of Health is so convinced of the benefits from improved nutrition that they are willing to cut down on other *health* programmes, they will indeed convince the Treasury of the importance of the subject and of its proper priority. Only thereafter can the Ministry of Health also argue for an increased budgetary allocation at the expense of other ministries, using arguments preferably based on *facts* about the causal relationships over time. If the arguments have to be based on assumptions rather than facts, this should be clearly stated. It is nothing to be ashamed of, because a lot of other investments are based on assumptions too!

An Overall Strategy of Assistance in the Field of Nutrition

By GÖRAN OHLIN*

A steady increase in the GNP is not in itself a guarantee that nutritional problems are being simultaneously and proportionally reduced. Vulnerable groups do not automatically share the benefits of an increased GNP. Furthermore there is evidence that nutrition can deteriorate in spite of rising incomes and food consumption. Thus, special efforts, directly aiming at improved nutrition, are needed. The author makes a plea for the establishment of a new action-oriented body within the UN system.

Even to speak of an "overall strategy" in any field of development or development assistance in presumptuous, and it may seem absurd for somebody who is in no way an expert in the field of nutrition to submit his reflections on a possible agenda for steps to improve nutritional conditions in developing countries.

My assumption is, however, that effective assistance raises a great many identical problems, regardless of the specific purposes at hand. Nutrition is only now attracting attention as an important and distinctive field of action, but development aid has been tried for some time, and some of the lessons learned may well be relevant.

Indeed, the present mood in development aid is one of hesitancy and stocktaking. A number of inquiries have been mounted to ask what the lessons actually are and what conclusions should be drawn with regard to the future. Many of the results seem pertinent to a policy for assistance in nutrition.

(i) The political climate for aid has deteriorated. Its original impetus derived from decolonization and the cold war, but these have faded in importance. The idea of large-scale, government-to-government development assistance, divorced from short-term diplomacy, leads a precarious

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political life, essentially sustained only by the relatively remote and abstract conviction that global community and international solidarity require rich countries to help poor ones. In many quarters this conviction is being eroded. In the US, the involvement with the Third World is tainted by the disaster in Vietnam and widespread diplomatic failure elsewhere. There, as in other industrial countries, aid is attacked from the right as futile squandering, while a growing chorus on the left attacks it for bolstering some governments in developing countries which obstruct rather than promote the social change associated with development. On the recipient side, the dependency which inevitably follows from large-scale aid is felt as more of an irritant, and "self-reliance" is coming to be proclaimed as a national imperative. Many of the multilateral organisations suffer from acute inefficiencies, the widespread recognition of which threatens to plunge them into a vicious spiral of recruitment difficulties, member-state disaffection and budgetary squeezes.

The trends for aid in the seventies and thereafter are anybody's guess, but one must clearly be prepared for the likelihood of the *status quo* being maintained or retrenchment, in spite of fervent exhortations to the contrary. The overall volume of aid is more likely to decline than to increase. Many have hoped for the closer integration of aid in the planning process, greater co-ordination among donors and recipients and a machinery for explicit reviewing of performance to put the allocation of aid on a basis of at least apparent rationality. But the lessons of the sixties now make many shrink away from any aid relationship that smacks of "leverage"; in this view, there should be a disengagement of aid which would to some extent be met by a shift from bilateral to multilateral aid, if only because multilateral organisations hold out greater hopes of politically acceptable solutions in the aid relationship.

(ii) In terms of strictly economic performance, the development record of the 1960's was not too bad. By historical standards, it might even be called remarkable.[4] But it was profoundly unsatisfactory on at least three counts. In the first place, a great many countries were left out. Secondly, even relatively high rates of growth seem inadequate in terms of the enormity of the gap between rich and poor countries, which continues to widen. Thirdly, and most importantly, it is widely felt that growth in the 'sixties in most countries failed to make an impact on the living conditions of the population at large.

It may well be argued that the gestation period of many of the necessary investments in communications, power, and the like is long, and that it would be wrong to expect too much in a short period of time. But the failure to improve material living standards is only one aspect, and not necessarily the most important, of a state of affairs in which unemployment seems to be calamitously large, urban growth is out of control, and the domestic disparities of living conditions remain glaring. The great hopes attached to education have been frustrated by the unexpected lack of employment opportunities for graduates from the educational system. The "quality of life", to use a fashionable term, is alleged to have deteriorated under the strains of a dragged-out transition, in which modernization has so far been more disequilibrating than beneficial. Inadequate participation in development and in national life also means a failure to involve and mobilize people as agents of change.

(iii) In the early 'fifties, development assistance was seen as a matter of transferring "know-how" and this was thought to be fairly easy. It proved not to be, and gradually the emphasis shifted to financial aid. These days, there is disenchantment with capital aid, but the difficulties of technical assistance have also been extensively confirmed. Family-planning is a case in point. There a very sizeable effort was eventually made, but the enthusiasm which prevailed a few years ago about the great potential contributions from family-planning has now given way to the glum suspicion that the impact has been marginal and does not promise to become much greater.

The experience of family-planning is perhaps of special relevance to nutritional policy. For one thing, neither of them represent the traditional concerns of governments in the developed countries and there is no clear model. Both are very largely inspired by the apprehensions of scientists and by a global view of the balance between resources and human needs.

What have been the weaknesses of family-planning policies? Opinions will differ, but no doubt the biggest problem has been political. Even when initial opposition was overcome, commitment was usually less than wholehearted. Secondly, family-planning programs have been hampered by administrative weakness and failures to solve the practical problems of communication and distribution. On the other hand, financial resources, as such, do not seem to have been the bottleneck.

If nutritional policies are to be more successful, great attention must

obviously be paid not only to diagnosis and prescription but to the whole range of practical concerns which constitute the web of political action.

The case for special policies of nutrition

If nutritional deficiency in developing countries were merely one of the consequences of poverty and could only be mitigated by increases in levels of income and consumption, there would be little scope for specific nutrition policies. It certainly is true, especially in the very poorest countries, that satisfactory nutritional levels will not be attained without significant economic development, but in the course of the last decade it has become clear that for a variety of reasons nutrition is far more than a passive reflection of the state of development.[2]

There is evidence that nutrition can deteriorate in spite of rising incomes and food consumption, for example, when industrially processed foods and beverages displace traditional ones of higher nutritional value, when breast feeding declines, when specially vulnerable groups fail to share in an overall improvement, etc. It should therefore also be possible to improve nutritional conditions without increases in productivity and income. Nutritional patterns can be affected through education, feeding programs, pricing policies, fortification, etc.

Above all, a fuller awareness of the enormous role of malnutrition in mortality and sub-standard health, impaired physical and mental energy, and low productivity has made it clear that undernourishment and protein deficiency are among the great obstacles to development and form links in the vicious circle of stagnation which must be broken. This is why nutrition can no longer be seen as a matter of welfare alone, and why it seems to offer great opportunities for active development policy.[1]

The suggestions prompted by this new priority accorded to nutrition in general and protein in particular are of great variety and heterogeneity. Each step in the sequence of production, distribution, and consumption of protein is seen in a new light when adequate protein supply is considered a threshold target. The measures proposed therefore cut across the traditional administrative and academic demarcation lines, ranging, as they do, from agricultural technology to child health. Moreover, the recommendations from competent bodies, such as the Protein

Advisory Group, vary in their degree of action orientation and cover the whole spectrum from research and fact-finding to development policy at large.

The result is that a highly specific concern tends to produce a comprehensive but diffuse and dispersed policy agenda. This difficulty, first of all, obstructs nutritional policy on the national level, but it also affects international protein policy quite profoundly.

The present need for policy experience

While there is a great wealth of policy suggestions in the field of protein and nutrition generally, the efforts to implement them lag far behind. Numerous recommendations made by private and official international bodies have invited the world community to give high priority to a formidable number of measures, but implementation will require a clearer allocation of responsibilities and some approach to cope with the bewildering variety of policy proposals.

As far as responsibility is concerned, the national and not the international level of action seems just now to be the critical one. The reason is not only the self-evident one that most measures for the rapid improvement of nutritional prospects in developing countries depend on the wholehearted commitment of the governments concerned. What is even more important is that basic decisions about what to do will only be effective if they are arrived at within the administrative system that is to carry it out. There is much instructive experience to suggest that, in a field so complex as that of nutrition and protein, the tactics—and perhaps even the strategy—must be determined by local conditions and be flexible enough to avoid administrative channels in which action tends to get bogged down. Most development policy is very largely a matter of administration, and this is certainly true of nutritional policy. As already suggested, the variety of potentially worth-while approaches makes it difficult to formulate coherent policy, but, in recompense, it offers an impressive range of alternatives to be tried out by a determined policy-maker who is committed to the objective and prepared to use the available machinery pragmatically (see the paper by Alan Berg on p. 183 of this volume for an illustration).

A final sense in which the national level is critical is that only national governments can request official international assistance. A

decade or more of international aid has made it clear that assistance which is imposed according to the notions of the donor is likely to be wasted and may even be counter-productive. The strategy on protein and nutrition, as on development at large, must therefore crystallize in the developing countries themselves. This is not to say that there is no role for assistance to play in that phase. As much experience has shown, the opposite is true. But the limitations on the roles of international organisations and of international aid at large must be borne in mind.

International strategy in the protein field can therefore hardly be formulated in the absence of national strategies. Can such national strategies be recommended or formulated with the necessary precision?

It is often suggested, and quite properly, that the complex character of nutritional problems makes it necessary to pursue a "multi-target" approach and to see all aspects of the problem as an integrated whole. But this is not very helpful. What is the road to wisdom in these matters?

In principle, there are abstract planning techniques, such as cost–benefit analysis and systems theory, which are supposed to help in the selection between alternative roads of action and the formulation of integrated programs. But these require extensive information about costs and consequences and do not seem practicable at the present time.

My non-expert contention is rather that there does not yet seem to be sufficient experience to recommend a strategy which ventures to give clear-cut priorities to all possible types of measures, nor is there sufficient uniformity of national conditions for such priorities to make much sense.

The present need then seems to be for an experimental phase, in the course of which two important activities will predominate: (i) the creation of the national political bases and some administrative machinery in the developing countries, and (ii) the systematic collection of experience and evidence to assess the field efficiency of different approaches.

A national policy on nutrition

Nutrition must, first of all, be inscribed on the development agenda, for instance, by a government declaration which also designates the ministry

primarily responsible and creates the necessary authority for inter-departmental co-operation. The promotion of a concern such as nutrition requires one authoritative source of initiative. Where it should be located may depend on personalities or on the administrative structure. A Ministry of Food and Agriculture, an exceptionally dynamic Ministry of Health or a special officer responsible to the Prime Minister may fill the bill. A section in the development plan should set forth the basic dimensions of the nutritional problem.

An institute or similar organisation, bringing together scientific and technical expertise from the various disciplines concerned, would seem to be almost indispensable. Even on a very modest scale, such an institute can provide a certain permanent commitment to the issue and vital liaison with international research.

Food habits are still most incompletely known and should be surveyed as a first priority. The types of active intervention which then recommend themselves include the support of vulnerable groups, i.e. infants, children and pregnant women, various possibilities of fortification, and more fundamental changes of patterns of consumption and production.

International assistance

Many international organisations are more or less closely involved in some aspect of the problem of nutrition, but it is hard to pin down the contribution of the United Nations family, chiefly because the boundaries distinguishing the nutritional concern from the promotion of agricultural production are so vague. Apart from the Protein Advisory Group, one cannot escape the impression that the specific concern with nutrition remains marginal and incidental.

A frequent complaint from international agencies is that requests for nutritional assistance are too few, reflecting the relatively low priority many developing countries still attach to nutrition. But to some extent this may be a reflection of the fact that nutrition is itself marginal in these organisations. What has been lacking has been a body specifically designed to prod the authorities and to promote the formulation of national policies and capabilities. So far, private and bilateral aid seems to have been rather more helpful.

The well-known inclination of specialized agencies to sell their own projects and the grave difficulties which plague their technical-assistance

activities make it unlikely that they could render effective help in the present phase of international nutrition policy.

What is needed now is, first of all, the mobilization of political will and technical assistance in the early stages of the formation of national policies. This is why a panel recently recommended the Secretary-General of the UN to create a new Committee of the General Assembly, in order to raise the protein issue to a level where it would be forced on the attention of the developing countries—and, for that matter, of the developed ones.[6]

The formulation and execution of nutritional policy is not likely to prove easy, even where the political will is present. It must be repeated that active policy of this kind is a new field, in which the experience of developed countries is negligible, in spite of the fact that they have produced an extensive scientific basis for it and have put into practice a few of the measures proposed for developing countries. The issues involved are only partially scientific in character, and they require a great deal of multi-disciplinary training. If there is to be a genuine breakthrough in this field, nutrition can no longer be regarded as an offshoot of public health. Nutritional awareness must penetrate large segments of the bureaucratic apparatus concerned with education, agriculture, industry, and economic planning at large. This may be the most serious bottleneck of all. Are the facilities for training the necessary types of nutritional experts adequate? Probably far from it.

Scientific research on new crops, single cells, amino-acid fortification, fish-protein concentrate, and the medical aspects of nutrition has received special attention from the scientists who have put nutritional policy on the map. In any international strategy for nutrition, such research will be indispensable and not only in the very long run.[5] The task of fixing priorities, in order to steer such research along the most important and promising lines, is not one to which a layman can make a contribution. Research activities could probably usefully absorb rather more funds than at present, but such funds are not likely to come out of foreign aid and may not suffer from the same stringency.

If the principal dimensions of international action concern (i) political will, (ii) training, and (iii) research in, at present, roughly that order or degree of urgency, what can be said about the organisational needs?

It is impossible to feel enthusiastic about the prospects of co-ordinating the various agencies of the United Nations family. The conviction is

certainly growing that such co-ordination cannot be achieved and that attempts to impose it will only compound bureaucratic paralysis. A more attractive solution might well be to encourage a fair amount of competition and to recognize the potential benefits of the actual independence of the specialized agencies.

Nutrition might, in fact, provide an opportunity for trying a radically new way of coping with the agency problem, by strengthening cohesiveness and rationality where it is really called for, i.e. in the developing countries themselves, and letting the agencies meet the demand for their services in a service-minded spirit.

The proposal for a Committee of the General Assembly, which has already been referred to, also provides for a competent advisory body which would essentially consist of a strengthened PAG. An additional suggestion which was mooted some time ago is that a special Protein Promotion Fund should be set up. Such earmarking would serve two purposes: it would enable donor governments which are convinced of the priority of nutrition to express this conviction, and it would strengthen the claims of nutritional policy in developing countries in its competition with rival claimants for aid resources.

The creation of such high-level bodies in the United Nations itself might meet the need for competent and authoritative technical advice and basic finance. By operating directly in the field, it would avoid the organizational rivalries and conflicts which inevitably arise when the agencies give advice on when their work is to be co-ordinated.

On the other hand, the time has not yet come, it seems, to try to commit the international aid system to a detailed strategy with specific priorities. Nor would such a statement serve much purpose. It would not at the present time be likely to convince donor governments, and it might actually, by prematurely committing international organisations to untested doctrine, be harmful and discredit the whole effort.

If, as I suspect, we know rather less about how to remedy nutritional problems in the field than we do about the scientific and medical aspects, then this is the knowledge gap we now have to close. Governments, in both developed and developing countries, need to be convinced, not indeed that nutrition is important, but that something can be done about it. Nothing would be more helpful in establishing such conviction than experience and occasional success.

This makes it particularly important that some developing countries

are already engaged in lively experimentation. From the point of view of a strategy of persuasion, it would seem advisable in the very short run to throw as much support as possible behind these activities, which promise to provide a firmer base of experience when the circle is widened.

References

1. Berg, A., and Muscat, R.: Nutrition and Development: the View of the Planner. *Am. J. Clin. Nutr.*, 1972: 25, 186.
2. Boerma, A. H.: Keynote Address to the First Asian Congress of Nutrition, Hyderabad. *FAO Nutrition Newsletter*, 1971: 9, 1.
3. Levinson, F. J., and Call, D. L.: Nutrition Intervention in Low-Income Countries: Its Economic Role and Alternative Strategies. *PAG Document* 1970. 1.13/1.
4. Pearson, Lester, *Partners in Development: Report of the Commission on International Development*, Chapter 2. Praeger, New York, 1969.
5. Scrimshaw, N. et al. (eds.): Proceedings of M.I.T. International Conference on Nutrition, National Development and Planning, Oct. 1971. In press.
6. *Strategy Statement on Action to Avert the Protein Crisis in the Developing Countries*. United Nations, New York, 1971.

Nutrition and Agricultural Planning in Tanzania

By GODFREY A. SEMITI*

Tanzania is faced with serious problems of malnutrition in the vulnerable groups. This is fully realized by the Government, which has given strong emphasis to nutrition intervention programs in its development plans. In some sectors, a successful start has been made, but more efforts are needed. This is true of mass education and training in nutrition and of the advancement of food science and technology. Less tangible but of basic nutritional importance are the export-import price interactions in the food field.

Tanzania is a predominantly agricultural country, with about 95% of the population relying on agriculture for its income. Only 8.5% of the economically active population receive money wages and one-third of these are employed in agriculture.[1]

The estimated total production of protein divided evenly could provide 52 g per person per day, as against a recognized standard of 60 g.[2] The average fat and oil consumption at 5.5 g per head per day is extremely low, compared with most other countries. The average availability of energy is believed to be about 2000 calories per day, compared with the requirement of 2500 calories per day. However, this overall picture conceals much malnutrition caused by lack of knowledge about food, by the uneven distribution of food between members of the family, between regions, and between seasons of the year.

The problem of ignorance is most serious, as it affects young children. Parents may believe that to have a full stomach is to be well fed. In rural areas they need to be taught to add high-protein foods, like legumes, to cereal meals fed to children, whilst for the wage-earning community there is a great need for a cheap, good-quality, baby food.

Maldistribution within the family arises from the custom of allowing

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the father and visitors to take the most attractive and most nutritious item at each meal, leaving little for the nutritionally more vulnerable groups, the mothers and the children.

Variations between diets in different areas can be very great. In Shinyanga Region, where cattle-keeping is the main occupation, meat consumption may be as high as 40 kg per head per year, whilst in the south-east of the country it is less than 1 kg.[2] Because most of the livestock in Tanzania are concentrated in a minority of the regions, the majority suffer a shortage of good-quality protein. The first five nutrition-status surveys carried out by the Human Nutrition Unit of the Ministry of Health gave daily reference protein intakes per consumption unit of 24 g in Karagwe, 27 g in Tabora, 27 g in Kisarawe, 42 g in Kilimanjaro, and 28 g in Morogoro.[3] Most of these levels are well below 35 g, the weighted average requirement of reference protein per day for a population.[4] This problem can be tackled to some extent by greater regional self-sufficiency, but, to avoid raising costs by less efficient production, better inter-regional shipping and transit facilities are also required. Seasonal shortages of perishable products would be reduced by better communications, whilst seasonal shortages of other foodstuffs need to be overcome by improved and extended storage facilities and by preservation of fruits and vegetables. Although it is believed that the most serious deficiency in Tanzania is of protein, the unreliable and variable rainfall leads to periodic droughts, when people may suffer prolonged shortage of food of all types. This calls for storage capacity to permit the carry-over of foodstuffs from year to year.

Problems in planning

Tanzania is a large country, with great diversity of the agricultural environment. Over much of the country, the presence of the tsetse fly prevents the keeping of livestock and makes it difficult to provide adequate animal protein in the diet. In the country as a whole, rainfall varies widely from year to year, and in the drier areas, particularly in central Tanzania, this leads to periodic catastrophic droughts, which are liable to be followed by famine. Elsewhere the poverty of the soils may limit the range of crops which can be grown, so that the population have to rely on crops tolerant of poor soils, like cassava and sorghum, though these may be low in protein and vitamins. In the south-

east, where tsetse and poor sandy soils occur together, the diets are the most deficient in protein.

To provide a sound basis for planning, one needs a detailed knowledge of the nutritional position in each area. Very little of this information is available at present, but a start has been made with the systematic collection of data for each district. Because many of the people live in small scattered communities and because of the size of the country, even with the right information, it is difficult to plan measures which will have a real effect in all the most remote areas, and in particular to arrange exchanges of goods to even out imbalances in the diets between different areas.

In planning direct measures to counter malnutrition in Tanzania, it is necessary to take account of the extremely low incomes of the worst-affected families. The plight of families in rural areas in a subsistence economy will not be improved by measures which require them to make cash purchases. In the short term, it is thus necessary to concentrate on showing the people how to grow a more balanced food supply, and how to use it effectively. Low-income families in the monetarized sector can only regularly purchase really cheap products. The main problem in providing them with food of high nutritional value is to do so at a price which they can afford. Although such direct measures can make an important contribution, general economic development is essential for a sustained improvement in levels of nutrition and well-being among all age-groups, in both rural and urban areas. To raise the purchasing power of the people, productivity must be increased, and this calls for substantial financial investment, much of it requiring foreign exchange.

For a basically agricultural country, this foreign exchange must come largely from the sale abroad of cash crops. Thus, although we need to grow a greater and more balanced food supply, this cannot be done at the expense of our cash crops without jeopardizing the development of our economy as a whole. In Tanzania, land is generally plentiful, but there are already some areas which are important producers of cash crops and in which there is now a serious shortage of land. A notable example here is the Kilimanjaro district, which produces arabica coffee. Diets in this area are deteriorating, as less and less land is available for fodder production for cattle.

The problem is aggravated by the diverging trends in the prices of the primary products which we sell and the manufactured goods which we

need to import. We find that we have to export more and more to finance a given quantity of imports. We are therefore unable to divert resources from cash crops into the production of the foods which our people need so badly.

Although Tanzania has been an independent nation for 10 years, the present structure of our economy was determined in the colonial period, when the emphasis in the development of the country was aimed at the production of raw materials for processing in the metropolitan countries. This has led to some anomalous situations. Thus, we export oilseeds, yet we import edible oil. We export cotton-seed cake, yet we import milk. Clearly our problem is not just to further development; in some respects we need to change the direction of development.

I have already stressed the importance of raising productivity and incomes in improving the nutrition of our people. Other aspects of development, such as improving communications and storage facilities, will also play a part. By setting up a Ministry of Economic Affairs and Development Planning and through the first and second five-year development plans, Tanzania has ensured that a very large proportion of the gross national product (19.3% in 1969) will be invested in development and that this development will take place in a balanced way.

National policy

A human nutrition unit was started in Tanzania in the late 1940s but it was small and largely concerned with administration. A more systematic approach was begun in 1965, involving the assessment of the nutritional situation district by district, training of staff, and the provision of district nutrition services aimed particularly at mothers and pre-school-age children. In 1967 food-science investigations were started in the Ministry of Agriculture.

Although nutritional considerations must always have played some part in determining agricultural policies, the second five-year development plan recognized the importance of human nutrition explicitly. Introducing the plan in May 1968, the President gave as the first objective ". . . the provision of an adequate and balanced diet for all our people" and went on to draw attention to the undernourishment of children, the importance of fruits and vegetables, the need for fruit-tree nurseries,

and the need to preserve fruit in time of surplus for use out of season. He stated that "... the mills which process sugar, flour and rice must consider the health of our people more than the appearance of the product; they must not think of just filling our stomachs without worrying about the nutritive value of the food". In the plan, crop priorities were formulated for all major agricultural and livestock commodities. These policies for each crop take account of the need for increased self-sufficiency and improved nutritional levels. It is the intention, as far as possible, to programme credit and extension work all over the country so as to ensure that the priority crops are developed. On the food-crop side, the plan aims at self-sufficiency plus a small surplus in wheat, oilseeds, rice, sugar and maize, an increase in meat and dairy production, and large increases in fruit and vegetables, particularly for home consumption. It is planned to maintain sufficient stocks of maize to cover years with bad harvests and to reduce the losses caused by insects and vermin, both in the field and in storage. A high priority is given in the plan to the rural infrastructure, for example, in the provision of feeder roads. The Ministry of Health is planning to put more emphasis on preventive medicine, in which better nutrition, particularly for children, is one of the first priorities. The district nutritional services are to be extended to cover the whole country.

Although the present structure of agriculture in Tanzania requires that the main improvement in national food supplies must come from the peasant farmers, the Government aims to make a significant contribution from state farms. For example, it is hoped to improve the edible-oil situation by state farms growing oilpalms. Other opportunities to improve national food supplies by making better use of existing by-products are being explored, particularly the possibility of producing cheap high-protein food from cotton-seed cake.

The promotion of better nutrition in the field

The task of treating and preventing malnutrition in the field is shared between the Ministries of Health, Agriculture and Rural Development. The Human Nutrition Unit of the Ministry of Health studies the standard of nutrition of the people and collects basic data about food supplies. It provides the district nutrition services by which cases of malnutrition are treated and parents are educated in prevention. Each clinic is

normally preceded by a lecture explaining the importance of a balanced diet and suggesting how the people can improve their diets. The opportunity is taken to encourage people to grow and eat more fruits and vegetables, to share high-protein foods equitably within the family, to prepare better baby foods, using locally produced ingredients, and to abandon harmful customs.

The overall responsibility of the Agricultural Extension Service is to further agriculture in line with the second five-year development plan. It encourages the growth of priority crops in each district, by giving advice and help with services, such as seed supplies and fruit-tree nurseries. Considerable emphasis is placed on explaining the nutritional value of different foods and instructions are given about the ways to use different crops to improve diets.

The Ministry of Rural Development provides advice to Ujamaa Villages on the growing and preparation of food to ensure a balanced diet.

Clearly for government to be effective in educating and advising the people on nutritional problems, it is necessary for the officers concerned to have training in the subject. To achieve this, a nutrition training course was started in the Ministry of Health in 1966 and more recently in the Ministry of Rural Development. In the Ministry of Agriculture, human nutrition has been included for some time in the certificate courses and is being given increasing emphasis, especially in the training of girls. Later a certificate course in food science and nutrition will be started.

In addition to activity in the field, efforts are being made to create a greater awareness of the importance of adequate nutrition among the population at large. On the initiative of the Research and Training Division of the Ministry of Agriculture, a 15-minute, weekly, radio programme entitled "Chakula Bora" (Better Food) has been started, whilst "Chakula Bora" is a feature of the Ministry's own monthly newspaper, *Ukulima wa Kisasa* (Modern Farming). Other opportunities of drawing attention to nutritional problems are being exploited, for example, during seminars for political leaders, by producing leaflets on the preservation of food, and by films.

The role of research

Besides undertaking experimental and development studies in food science and nutrition, the Research Division of the Ministry of Agriculture is taking the initiative in promoting some pilot schemes. Research in crop production is now giving less emphasis to cash crops and more to food crops and especially to the development of crops like the soya bean, the sunflower and vegetables which can be used to correct existing deficiencies in the diet. In Tanzania, the production of legume grains tends to be limited by low and unreliable yields, and it is hoped to overcome this by improving both the varieties and the agronomy. Efforts are being made to improve the nutritional quality of maize by breeding for higher lysine content and by developing and popularising yellow varieties. It is unfortunate that in Tanzania only white maizes are at present acceptable—this is due to a general belief that goodness and purity are associated with a pure white colour. An investigation being carried out into storage methods on the village level should indicate ways to reduce food loss and deterioration.

The Food Science and Nutrition Section of the Division is developing simple methods of food preservation which can be used in villages. National recipes are being collected and improved with the aim of producing dishes which are balanced within themselves, so that each member of the household eats a nutritious meal. Earlier on, I referred to the need for a cheap baby food. We have studied the fortification of cereals with legumes, vegetable flours and fish-protein concentrate and we have produced a baby food called "Afya" (Health), which has been tested in the field and has been trial-marketed.

In south-eastern Tanzania, where the deficiency of animal protein in the diet is most serious, the Research Division has taken the initiative in building up a large herd of cattle at its Research Station, thus providing an opportunity to study the problems of livestock husbandry in the region and providing a source of stock for issue to the farmers.

Assistance from the developed world

Although I am mainly concerned with the steps that we are taking in Tanzania to relate our agriculture to our nutritional needs, I think

it may be of interest if I mention one or two ways in which the developed countries can help us.

One of our greatest needs is for a cheap baby food and for nutritious foods for children. Perhaps international co-operation could assist by accelerating the development of cheap foods, using different protein sources, such as fish, milk and legumes.

I have already drawn your attention to the generally low prices we receive for our exports. For some commodities, international agreements have been drawn up in an attempt to stabilize prices at a reasonably remunerative level. In the case of other commodities, like sugar, the market for the produce from developing countries is limited by tariffs and quotas designed to protect competing industries in the developed countries. For coffee, there has been very little increase in world consumption over the last few years. This is partly because in many countries coffee is taxed heavily to raise revenue, making pure coffee a luxury item, and holding back consumption. I would ask that, when the developed countries are negotiating agreements or revising tariffs and taxes, they should give sympathetic consideration to our views, and consider the effects of their measures on our economies, our development, and the nutrition of our people. In addition, we would welcome anything which can be done to reduce the costs of the inputs we need to further our development. For instance, I feel that we are sometimes forced to pay rather inflated prices for breeding stock, particularly when such stock is being obtained through a loan agreement which puts us in a poor position to bargain.

Conclusion

In my paper I have explained that, to combat malnutrition, we are placing great reliance on education, and in Tanzania, with its enormous agricultural potential, it should be possible to make much progress in this way. Although education is our main line of attack, I have described the many other approaches which we are applying simultaneously. To achieve greater co-ordination of these measures, and to step up our activity against malnutrition, we have plans for a National Food Science and Nutrition Institute, which we hope to establish with Swedish assistance.

Notes and references

1. *The Economic Survey and Annual Plan* 1970–71. Government Printer, Dar-es-Salaam.
2. *The Protein Problem in Tanzania.* Report for the Protein Advisory Group of the UN, 1970.
3. Maletnlema, T. N. (1970). *Human Nutrition Activities in Tanzania.* Part II. Mimeographed.
4. FAO/WHO Expert Group (1965). *Protein Requirements.* FAO Nutrition Meetings Report Series No. 37.

Nutrition Surveys and Nutrition Training in Nigeria

By A. OMOLOLU*

Nigeria is the most populous country of Black Africa. The nutritional problems are vast and the main patterns differ from one region to another. There is a great need for well-trained personnel to staff key positions in the federal and provincial governments, at universities, at high schools, etc. The Food Science and Applied Nutrition Unit of the University of Ibadan is an important training centre, on both the national and the international level.

Before the Second World War, nutrition studies of limited scope had been performed in Nigeria only in one or two areas.[4, 5] After the war—during which Britain learnt a lot about the great importance of food and nutrition on the morale, working efficiency and health of its population—a commission was appointed to look into the state of nutrition in the colonies (of which Nigeria was one). As a result of this commission's report, medical research councils were recommended to collect data on nutrition and health and the colonies were encouraged to appoint nutritionists. Dr Bruce Nicol was appointed as medical nutritionist to Nigeria and formed the first nutrition unit in the country. The reports of his studies[6] conveyed the first comprehensive picture of the state of nutrition in the country. Since then, a lot of work has been done in the field of nutrition by the Institute of Child Health, University of Ibadan,[1, 2] the Food Science and Applied Nutrition Unit, University of Ibadan,[8] the ICCND[3] and a host of others. From these studies, some conclusions are warranted with respect to the food intake and the nutritional status of the population of Nigeria.

Food intake. The average calorie consumption is estimated to be of

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Table 1. *Food intake in different seasons at four centres in Nigeria.*

Locality	Calories/head/day		Protein/head/day	
	Pre-harvest season	Post-harvest season	Pre-harvest season	Post-harvest season
Ijana Itawura	1 640	2 050	35	51
Igun	1 760	2 100	36	60
Oke Ila	1 550	1 830	27	37
Abebeyun	2 000	2 490	44	57

the order of 2 200 per person and day. Most of the groups that are low on the socio-economic scale and the people of the rural areas do not, however, reach above 1 800–2 000 calories. The figure for total protein consumption, 60 g per head per day, does not lag too much behind the minimum requirements. But the quality of the protein is unsatisfactory, only 7 g being of animal origin. There are great seasonal variations in food intake. It is not unusual for calories and protein to show a fall of 20–30% or more between the harvest period and the pre-harvest period (the "hungry season"). Table 1 gives some data in this respect.

With respect to other nutrients, the most striking deficiencies relate to vitamin A (mainly children under 5 years of age and pregnant and lactating women in the north) and to vitamin B (particularly riboflavin). The spread of the use of red palm oil to the north means an improvement of the situation with respect to vitamin A.

Nutritional status

Pregnancy. The average gain in weight during pregnancy in the rural areas is 7 kg, a figure which falls very short of European standards, where a gain of 12 kg is usually indicated. In individual cases there may be little or no weight gain at all. Anaemias are common during pregnancies, both of the iron-deficiency and the megaloblastic type.[7]

Children. The birth weight of children in rural areas averages 2.8 kg, i.e. some 15% below European standards. There is a high neonatal and infant-mortality rate. At one of our health centres, the neonatal mortality rate was 45 per 1 000 and the infant-mortality rate 135 per 1 000. This was in a centre with *some* health services. Ten years ago,

the same village, without any health service, had an infant mortality rate of over 200 per 1 000.

Also in the age-group 1–4 years the mortality rate is very high. In one study it was 36 per 1 000, as compared with 0.7 in Sweden and 0.8 in the UK for the year 1965. Protein–calorie malnutrition (PCM) is responsible for a high percentage of the deaths in this age-group (in one study it was 21%). The ICNND survey (1967), in a study of 432 children aged 0–5 years, reported a prevalence of severe malnutrition of 3.2% (marasmus 1.6%, kwashiorkor 1.6%). This is the "top of the iceberg", as it looks at any given moment.

Malnutrition and undernutrition play a great role also during school age. It is an important factor behind the high drop-out and repeat rate of 30% reported during the first 2 years in public primary schools. Many children have to walk up to three miles to reach school, most of them without having had any real breakfast. Only a privileged few can afford to buy enough food to fill their stomachs during the luncheon break. No wonder that the results of school education, with long days on empty stomachs, are unsatisfactory.

Adults. With the very low pre-harvest intakes reported above, farmers find it difficult to work hard and plant large acres of land. The result is that food production has remained static, whilst there has been an average increase of 2.8% in the population. Over the past year, food prices have increased by 50–85% in most areas! Most industries report a low manpower productivity rate and high absenteeism and illness rates. There is no doubt that malnutrition plays a large part also in these troubles.

Nutrition surveys

Nutrition surveys are an essential element in the planning of programmes for action in the field of nutrition. This was realized as early as the late 1940's, when a nutrition unit was started in the Federal Ministry of Health and charged with this task.

In 1958, the Institute of Child Health was founded at the University of Ibadan. One section of this Institute was concerned with child nutrition. It carried out a long-term study in the Ilesha area from 1958 to 1967 and short surveys in other parts of the country (Pankshin in the north,

Burutu in the midwest, Adiasin and Port Harcourt in the east). In 1963, this nutrition section of the Institute of Child Health became the Food Science and Applied Nutrition Unit of the University. Since its inception, this Unit has carried out at least one nutrition survey every year in different parts of the country.[8] In addition, in 1965, the Unit co-operated with the ICNND team from the USA in a country-wide survey.[3]

At the same time, the different agricultural ministries in the country and the staff of the Department of Agriculture at the University of Ibadan started collecting data on food production and food use all over the country.

Training of personnel

In the late 1950's a Farm Settlement and Training Scheme was introduced, in order to get literate youths from the country back to farming. Youths with 6–8 years of schooling were sent to farm-training institutes for 2 years. They were taught modern farming practices. After training, they were allocated to farm settlements near their towns of origin. The settlements were on farming lands up to 1 000 acres in size, which the Government had acquired. The settlers lived in small settlements with amenities and were allocated about 10 acres each for farming. Tractors, storage premises and advisory personnel were made available, and the foods produced were bought at agreed prices by the Government, some of the money being used to pay for the training, houses and services. Though the scheme has not worked as well as was planned, it has produced a much-needed breed of young farmers and is still going on.

Since the early 1960's, a vigorous policy of training personnel in food and nutrition has been adopted by the country. At the universities, emphasis has been laid on agriculture, with the result that now every year at least 200 graduates are produced in this field alone.

Agricultural-extension workers are now being trained in large numbers in the field of food science, to assist farmers in the improvement of food crops. Until recently, most of the agricultural extension workers were trained to help in the production of cash crops like cocoa, rubber, palm-oil, groundnuts, cotton, etc. About 150 village community workers are being trained every year to live in the villages and help the families with handicrafts, child care, etc.

The Food Science and Applied Nutrition Unit of the University of Ibadan has trained over 300 middle-grade applied nutritionists since 1963. Annual 8-month courses have been run with interdisciplinary trainees from the Ministries of Agriculture, Health, Education, Community Development and Food Industry. Trainees have come not only from Nigeria but also from most of the other countries of Africa, including the Cameroons, Ethiopia, Gambia, Ghana, Kenya, Lesotho, Liberia, Senegal, Sierra Leone, the Sudan, Swaziland, Tanzania, Uganda and Zambia. There have also been trainees from outside Africa, from Cuba, India, Korea, Pakistan, the Philippines, Thailand and Tonga, to mention a few. These courses have become popular and international organizations like the UNICEF, the FAO and the WHO are offering fellowships for countries to send candidates.

In October 1971, the Unit started a 10-month postgraduate course for a Diploma in Nutrition. The aim is to train specialists in different branches of nutrition—food-consumption surveys, nutrition education, food analysis, clinical nutrition, etc.—so as to produce teachers who will train workers in their own countries.

The Food Science Section of the Unit and the Food Science Section of Ife University are working on local food preservation, fermentation, and food technology.

Major developments

The ambitious programme of nutrition surveys, including data collection and training of personnel, over the past 10 years has extended considerably our knowledge of the nutrition problems of Nigeria, as well as of their cause. At the same time, major developments have taken place in the direction of the engagement of Federal and local governments in the fight against malnutrition. Most of the states now have nutrition units attached to their Ministries of Health. Within the National Health Councils—consisting of the Federal and State Ministries of Health—an Advisory Nutrition Committee has been organized, with nutritionists from states and universities as members. This committee advises about training, research and policy in nutrition.

In co-operation between the Federal Ministry of Agriculture and university institutions, a Food Balance Sheet has been prepared. Furthermore a National Agricultural Council, consisting of members from the

State and Federal Ministries of Agriculture and the universities' departments of agriculture has been formed. This Council meets every 3 months to co-ordinate policy on agriculture and food for the country.

In the field of education, food and nutrition has been introduced into the primary schools as part of health education. Home economics is taught to girls in secondary schools and soon all teacher-training colleges will teach health education and first aid to their student teachers.

The future

The Government is now aware not only of the nutritional needs of the country but also of the great importance of nutrition in the socio-economic development of the country. For the first time, the National Development Plan for 1970–74 discusses the nutrition of the people. During this period, the Federal Government will spend £N 1 143 million on research on food crops, £N 6 000 million on agricultural credits, and £N 0.9 million on grants to research councils and institutes, whilst the state governments will spend £N 13 000 million on food crops, £N 2 000 million on farm training institutes, and £N 5 200 million on agricultural credits.

These are impressive figures. At the same time they form a challenge to introduce the basic aspects of food and nutrition in a wide setting. It is imperative that an interdisciplinary Food and Nutrition Board should be formed without delay and charged with the task of devising policy and co-ordinating the work of the states, the federal government, the universities, the farmers and industry. By co-ordinating the work of the different ministries and institutions, this board will abolish duplication, direct attention and research into areas of need, and plan for the whole country. With the facilities that already exist in the country for the collection and analysis of data, the training of personnel, and planning, there is no doubt that, with such a Board, Nigeria will be able to make a big impact on the nutrition of its people in a very short time.

References

1. Collis, W. R. F., Dema, I., and Lesi, F. E. A.: *Wa Med. J.*, Ser. 2, 1962: *11*, 131.
2. Collis, W. R. F., Dema, I, and Omololu, A.: (*a*) *Trop. Geogr. Med.* 1962: *14*, 140; (*b*) *Trop. Geogr. Med.* 1962: *14*, 201.

3. ICNND, *Nutrition Survey of Nigeria* (1967).
4. McCullock, W. E.: (*a*) *Wa Med. J.*, Ser. 1, 1929: *3*, 8; (*b*) *Wa Med. J.*, Ser. 1, 1929: *3*, 36.
5. Moore, D. F. G.: *Wa Med. J.*, Ser. 1, 1933: 7, 97.
6. Nicol, B. M.: *Br. J. Nutr.* 1952: *6*, 34; *Br. J. Nutr.* 1956: *10*, 275; *Wa Med. J.*, Ser. 2, 1958: *7*, 185; *Br. J. Nutr.* 1959: *13*, 293; *Br. J. Nutr.* 1959: *13*, 307.
7. Osifo, B. O. A.: (*a*) *Br. J. Nutr.* 1970: *24*, 683; (*b*) *Br. J. Nutr.* 1970: *24*, 689.
8. University of Ibadan, Food Science and Applied Nutrition Unit. *Reports of Nutrition Surveys*, 1963–70.

Nutrition as a National Priority: The Lessons of the Indian Experiment*

By ALAN D. BERG**

India has in recent times proved to have an unusual capacity to handle nutrition problems of great severity and dimension (the Bihar drought in 1967, the Bangladesh refugee invasion in 1971). The "green revolution" has spread faster in India than in most other countries. Yet the problems remaining are still intricate and far-reaching. Examples are given of the unconventional methods used to tackle them.

In the last week of 1969, Indira Gandhi's wing of the Indian Congress Party unanimously adopted a *Children's Charter* as a major plank of its platform. The act was another indication of a growing public concern for nutrition as an important aspect of national policy. If fully implemented, the *Charter* will provide for nearly half a billion dollars a year to guarantee 80 million pre-school-age children a minimum diet.

Though it is too early to judge the effect of this political commitment, India already has taken substantial steps to build a national nutrition policy, to launch a national program, and to establish projects—both operational and experimental.[1] This is not to suggest that India's nutrition problems have been solved or are even well on their way to solution, but an encouraging and probably irreversible beginning has been made.

The Indian experience for the past few years may offer lessons for other countries similarly concerned with nutrition needs. It also provides

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The interpretations and conclusions are those of the author and do not necessarily reflect the views of the above organizations.

a few insights into the way in which social movements are made and a view of the decision-making process in a democratic developing country and the role of foreign technical help in that process.

Until recently, the concept of nutrition as an integral part of national growth was largely academic. An article in the October 1967 issue of *Foreign Affairs*,[2] explored the relationship between malnutrition and economic development. It sought to justify on development grounds a field of activity traditionally viewed as humanitarian. The point was made that the staggering mortality resulting from malnutrition and the reduction of mental and physical performance (caused by the malnutrition-related retardation of most survivors) constitute a major impediment to national development. Much of what was then presented rested on theory and hypothesis. This paper traces the history and implications of the Indian experience, which in the intervening period has tested some of these concepts in an operational context.

Genesis of an involvement

Nutrition as a profession is no stranger to India. For the past half-century India's laboratory and clinical work has ranked with the finest in Asia. As in most nations, however, the linkages between the scientific community and the government and political policy-makers were few. Laboratory findings often remained in the laboratory. Meanwhile, the policy-maker saw malnutrition as a welfare problem and approached it accordingly.

It took the Bihar famine of 1966–67 to dramatize the magnitude and implication of malnutrition. Ninety million people in eastern India were trapped in the worst drought in post-independence India. Pictures of children with bloated bellies appeared regularly in the world press, accompanied by predictions of a vast natural disaster involving millions of deaths from starvation.

Fortunately, the forecasts proved to be wrong. The Indian Government mobilized a massive relief program and, aided by substantial quantities of food from the international community, was able to hold the line until the next monsoon. The experience, however, made a deep impression on the Indian officials who participated in the relief effort.

This concern was intensified by findings reaching India during the same period that suggested a link between malnutrition and mental

development.[3] The government officials already knew that malnutrition was the major cause of childhood deaths.[4] There was also awareness that poor food affected bodily growth and thus physical performance. However, for the first time there was now a realization of the connection between protein deprivation in early life and the sluggishness commonly observed among the extremely poor. When the head of the national laboratory reported that 80% of Indian children suffered from "malnutritional dwarfism", some Indian political leaders publicly expressed fears that India could be raising a generation of substandard citizens. Moreover, the problem seems to be getting worse rather than better. The average Indian today receives 8% less protein than in 1960.[5] The implications are ominous.

Inadequacies of the agricultural revolution

The Bihar crisis accelerated the effort by the Indian Government to produce more grain. Successful introduction of the high-yielding seed varieties, combined with rapidly increasing inputs of fertilizer and other accouterments of modern agriculture, have led to rapid increases in production.[6]

Although of obvious benefit to the well-being of the population, the current emphasis on cereals is an insufficient answer to India's nutrition dilemma. In fact, a composite examination of 220 Indian diet surveys,[7] coupled with national economic projections, suggests that, unless a new nutrition strategy is implemented, at least a generation will pass before many Indians will be able to afford an adequate diet.[8] The data suggest that the *per capita* disposable income must reach from $4 to $5 a month to achieve an acceptable diet. Between 60 and 70% of India's urban dwellers fall below this line, and the percentage is higher in the rural population. One-third of India's families would need at least twice their current incomes to attain adequate diets on the basis of rising earnings alone. Even on the optimistic assumption of a 3% annual rise in *per capita* real income, it would take 30 years for one-third of India's families to reach the required level. With the present population-growth trends, this means a 5.5% annual national growth rate—compared to a 3.5% growth trend over the last 13 years.[9]

Although the new Five-year Plan projects food-grain self-sufficiency

by 1972, broad distribution of the additional income generated is not assured. Indeed, it seems likely that, if the agricultural revolution continues along the current path, the income distribution problem will be further aggravated.[10]

Policy-makers have begun to recognize that national development cannot take place unless hundreds of millions of the poor begin to experience some betterment of their welfare and believe they are participating in national development. There is also a growing appreciation of the consequences if this participation is not achieved. As a Home Ministry report warned last December, failure to improve the lot of India's masses "may lead to a situation where the discontented elements are compelled to organize themselves and the extreme tensions building up within the 'complex molecule' that is the Indian village end in an explosion". It was against this backdrop that the Home Minister suggested, "Unless the green revolution is based on social justice ... the green revolution may not remain green."

No one factor alone will meet the minimum aspirations of the very poor. But of the critical factors, better nutrition could play an important and relatively fast-acting role; it has a direct and visible relationship to well-being and is within India's means. For even those now or soon to be receiving an increased income, it should not be assumed that more money will automatically lead to a better diet. The traditionally accepted principle that better diet is a function of increased income undoubtedly applies in certain societies and at certain income levels. However, it has been my observation that in some situations there may actually be an inverse correlation between income and nutrition when income increases are modest and start from a low base. To many, an increase in wealth brings with it access to the monetized part of the economy, and such items as ballpoint pens and transistor radios compete with food for the first time. There is little definite knowledge about the relationship between nutrition and income growth at low levels. People may eat more but not necessarily better. The common example in India is the shift with the first increment of income from sorghum or millet to rice and from home-pounded rice to polished rice; the latter is aesthetically more pleasing but nutritionally less valuable. Similar situations can be observed when increased income makes it possible to "buy up" from unrefined sugar (jaggery) to the less beneficial refined sugar. A recent survey in western India confirms that a statistically significant drop in

protein intake is possible as incomes rise and cereal diets are "upgraded".

Many rightly point to the substantial increases in milk purchases that come with higher incomes. But, looking beyond, we also see that related to increased income is a dramatic decline in breast feeding. Sixty per cent of the lower-income Gujarati women (under $2 *per capita* income per month) continue to breast feed their children beyond 6 months. This figure drops sharply as incomes rise. Only 8% of the higher-income mothers (above $9) offer the breast at the same period. The nursing Indian mother produces approximately $^1/_2$ liter of milk per day. A comparable quantity of commercial animal milk would cost more than $2 a month, a substantial portion of income. Our calculations suggest that a mother moving up the medium-income ladder purchases only one-third as much milk (and most of this is used in tea) as is lost due to early weaning.

In a rural setting, increased incomes usually result from the reorientation of traditional agricultural practices. However, attractive price incentives for wheat, essential to the agricultural revolution and many increased incomes in India, are partly responsible for the declining acreage used to grow high-protein pulses. As wheat production has gone up over the last 3 non-drought years, the *per capita* production of pulses—a major protein source in the Indian diet—has declined by 27%.

Fortification innovations

It was soon apparent to Indian policy-makers who turned their attention to nutrition that many of the highly nutritious foods—natural and processed—were priced out of the reach of all but the very affluent. This was especially true of those foods needed for very young children. Experience had further demonstrated the difficulty of altering established and preferred food habits. If diets could be improved inexpensively without requiring conscious decisions by consumers to buy, cook or eat differently, the likelihood of success was greater. They, therefore, began to give attention to the use of already established foods as carriers of the necessary additional nutrients.

Besides its obvious value in improving nutrition inexpensively, fortification has other interesting developmental implications. It is a concealed form of income supplementation—for specific purposes. It

achieves this without the need of a massive organizational or administrative apparatus, such as is required for the health services, welfare services, or even child-feeding programs.

India's first venture into the fortification of cereal foods came with the introduction of "Modern Bread" in January 1968. During the drought years of the mid-1960's, the Food Ministry made a concerted effort to increased bread consumption; wheat, unlike rice, was available in large quantities from abroad. With help from Australia and Canada, nine Indian Government "Modern Bakery" plants, capable of producing 100 million loaves of bread a year, were established in the major cities of India. To each loaf baked in these plants, the Government added the synthetic form of the amino acid, lysine, to increase the protein value, plus vitamins and minerals adjusted to India's major nutritional maladies, namely, vitamin-A deficiency and iron deficiency.

There had been some suspicion early in the project that only the urban wealthy were bread-eaters and would benefit. Recent studies report otherwise.[11, 12] In Bombay, 40.6% of those with family incomes under $26 per month are daily bread consumers. Also, bread is increasingly reaching the non-urban areas. Three-quarters of the large bread producers report that from 10 to 30% of their sales are rural. Although bread is not a major factor yet in the general Indian diet, commercial bread production is expanding rapidly—a 250% increase in the 1960's—and an annual compound 13.2% growth rate is projected for the next 5 years.[13]

More importantly, the success of "Modern Bread" had an effect in dramatizing the possibilities of fortification to the Government. Last year the Secretary of Food announced India's adoption of a policy of fortification. This in turn led to Government approval of a large-scale project designed to fortify a more traditional Indian food, *atta*—the ground-wheat product used to make the Indian *chapatti*, the round, flat, bread-like staple of the northern Indian diet. People who buy the ready-milled *atta*, the least expensive form, are often from the lowest economic group. Beginning in February, Bombay residents purchasing *atta* also received sizable doses of vitamins, minerals and protein (in the form of peanut flour, an oilseed product seldom used for human consumption in India). The program has since started in Calcutta and is scheduled for introduction in other major cities.

Although it reaches the people at the bottom of the income ladder,

fortified *atta* benefits only the urban population. Because nearly 80% of the Indians live in rural areas and each of India's hundreds of thousands of villages has its own wheat-grinding equipment (*chaki*), it is logistically impossible to undertake a rural wheat-fortification program. As a result, a search was made to identify low-cost, centrally processed foods that already reached all elements of the population.

The most attractive item meeting these criteria was salt. Everyone uses salt. Those not participating in the monetized economy barter for it. Produced in relatively few places, salt is consumed all the year round in nearly equal quantities at all income levels in society. Those in need of the greatest nutritional help, in fact, may be the heaviest consumers—it is often the only flavoring agent they can afford. The vast majority of Indian women and small children suffer from anemia. Salt with iron added could reduce this condition significantly at a cost of only about $4 million a year. Calcium could also be added, without increasing the cost of the salt. Laboratory and clinical tests on iron- and calcium-fortified salt have been successfully completed and field tests are scheduled to begin this year. Laboratory experiments to incorporate also vitamin A and synthetic amino acids are at an earlier stage.

Research is also taking place on the fortification of tea. Contrary to the common belief that tea was almost solely an adult drink, surveys completed early this year showed that in some states tea is given regularly to 78% of the "under-five" population. Unlike nearly all other food products, tea is consumed in quantity by rich and poor in both rural and urban areas. A recent study in the state of Gujarat[12] revealed that 87% of the villagers give tea to their children, including 84% of the lowest income group (family incomes of under $13 per month). This demonstrates the extensive and effective distribution network of the tea companies, a network now being examined as a possible distribution vehicle for other nutrition-improvement projects. The recent interest in tea fortifications stems in part from the discouraging findings of an investigation into the possibility of fortifying rice. Another recent study[14] reported that the vast majority of Indian rice-eaters cook their rice in large quantities of water, which is then discarded. Hence, any fortification would also be discarded. In the case of tea it is the residue itself which is consumed. Professional tea-tasters in Calcutta and London have tested Indian fortified tea without detecting a difference in the character of the product. Research, however, is still at an early stage.

New role for private enterprise

A second feature of the Indian experiment is the role of private enterprise. In contrast to most other developing countries, India has sizable and sophisticated food-processing and pharmaceutical industries. Yet until the recent surge of nutrition awareness and activity, these industries were little involved in redressing the country's nutrition needs. In mid-1967 a group of business leaders met to evaluate the responsibility and the commercial opportunity.[15] What emerged has grown into a 32-firm organization—known as the Protein Foods Association of India—designed to do collectively what few single firms can afford to do alone.

The new group's priority project is a series of regional food-habits surveys. Little was known of what people ate (by income, cultural group, and community size), why and how it was prepared, and how distributed within the family. The western regional study[16] pinpointed several foods most popular in the lowest economic classes that might qualify for fortification activities or improved genetic seed development.[17] Similarly, specific, widely consumed condiments emerge as potential carriers of better nutrition to the lower classes.

The industry group inaugurated in September an institutional advertising campaign to create greater public awareness of the nutrition problem and keener receptivity to new foods being developed by individual firms. The campaign—which involves all mass media, including a film scheduled for release in 3 500 cinema houses throughout the country—plays on the national penchant for astrology: "Your child's plate is his horoscope".

These activities may help to accelerate the introduction of a series of nutritious foods into the market. Twenty-seven new beneficial products are under development, being market-tested or now being sold. They also have compelled attention to be paid to new marketing mechanisms, including involvement in products made possible by potential Government-financed feeding programmes.

The Government's response to the interest and initiatives of industry has in general been positive, if belated. Throughout 1969, a joint government–industry committee conducted hearings into the problems of the food-processing companies with an eye to meeting industry needs for food standards, more flexible licensing procedures, and possible incentives.

Redirecting child feeding

A third element of India's nutrition effort is the school- and pre-school-child feeding program. Considerable numbers of children were reached for the first time during the Bihar famine, and the visible effect of the feeding on the youngsters was dramatic. Today 17 million Indian children receive a regular meal. This often includes *Bal Ahar* (child's food), a low-cost, locally produced, nutritious, cereal blend that combines donated American wheat with inexpensive Indian oilseed protein. After a stumbling start, prospects for widespread usage (60 million lb. this year) now appear favorable.[18]

Such direct feeding programs presumably have effects on learning ability and classroom performance. The child with an empty stomach is neither alert nor receptive. He is neither physically nor mentally equipped for the rigors of formal education.[19] During the meetings that led to the recent *Children's Charter*, the interim Congress Party president raised such issues with the senior decision-makers of India's economic policy. After learning from them that some $300 million a year is spent on primary education, the Congress officer asked whether it would not be better to spend a proportion of these funds to equip the child better nutritionally to cope with the school experience.[20] The radical implications of this exchange reflect the recent evolution of nutrition as a public policy issue.

Novel concepts in nutrition education

A dimension lately added to the Indian experiment is nutrition education. A better use of the existing food budget via better consumer understanding has long been recognized as an important element in nutritional improvement. However, world experience in bringing this about has not been encouraging. Both the effectiveness and economics of the traditional extension approach to nutrition education are open to question.

The emerging Indian preference is to approach nutrition education as not so much a nutrition problem as a communication problem. Mass media are employed. Commercial advertising agencies have been brought in to assist. Concerted efforts are made to avoid the earnest "four-food groups" clichés of the standard nutrition posters and to introduce instead appeals playing on universal values. (One theme proposed for mass-

media transmission is: "Mother, love is not enough".) Adventure comics with a nutrition message have been distributed to millions of children who had never before been exposed to this medium. Market-research techniques are employed to find out what people eat, why they eat it, and what they regard as good for them. Recent studies have shown a higher food–health understanding among the people than was expected—but often a misunderstanding of what specific foods are good for them. (The popular local version of yogurt as a protein source is recognized by only one-seventh of the people of Gujarat who appreciate the value of milk.)

Special efforts are being made to reach people where they regularly congregate. The Government, for example, is currently producing 10 short movies on nutrition to reach the millions of ardent Indian filmgoers. The Food Ministry is organizing a new information division that will attempt to bring the nutrition message to towns and villages through the use of mass media. To reach the unlettered, instruction for dietary improvement is now being transmitted by All-India Radio through both community and private receivers.

Commercial-product advertising is also being enlisted to promote nutrition. "Modern Bread" has conducted a major nutrition promotion drive, linking the need for better nutrition to their product:

> "Why are today's Japanese children growing taller than their honorable fathers?" asks one advertisement. "They're getting more proteins, . . . Amazing how a small race is growing taller. Today's Japanese children are an average of three inches taller than their parents—the result of protein-rich diets in postwar Japan! . . ."

Lessons learned

Giving unified direction to this multiplicity of activities[21] is an interministerial committee at Cabinet Secretary level, which is chaired by a member of the Planning Commission. This group last year developed an approach to nutrition that formed the basis of a chapter in India's Fourth Five-year Plan. Eighty million dollars has been budgeted for a nutrition programme in the Plan.

This catalog of new starts is not intended to suggest that India's nutrition problems are under control. The gains are significant—and cumulative—but must not be magnified out of proportion. The need is of such magnitude that even the best of government intentions may fall short.

Massive logistical and cultural barriers stand in the way of reaching the neediest elements in the society. How do you reach the infant? How do you reach the rural, sometimes non-monetized population? How do you identify the critical policy decisions (for example, market incentives) that can influence basic nutrition patterns? Obviously, one of the greatest constraints is sheer poverty. For all the growth accomplishments, it is easy to lose sight of the enormous shortage of resources of all kinds in countries afflicted with severe underdevelopment.

The possibility of reaching the targets of need is, however, greatly strengthened as a result of the experience to date. India now recognizes the problem and is committed to doing something about it. Although implementation of the commitment still poses many questions, an encouraging start has been made. From this beginning, certain lessons emerge—many with significance beyond the field of nutrition.

(*1*) First is the matter of scale. The necessity of working within the limits of overstrained Health Ministry budgets has inhibited nutrition experts in many countries from facing up to the magnitude of both the challenge and the opportunity and thus from taking the kind of quantum jump now planned in India. Today there are officials in New Delhi who are working on the premise that a massive attack on malnutrition could virtually eradicate the major nutritional diseases, just as smallpox and malaria have been overcome in India and in much of the world. This is a scale of thinking perhaps never before envisioned.

(*2*) Next is recognition that programs do not develop according to a predetermined master plan. Although the ultimate objective must be clear, opportunities—often unexpected—must be seized and exploited as they arise. For example, early nutrition efforts were sidetracked because of the Bihar famine, but the widespread public concern aroused by the famine gave strong impetus to efforts to produce and develop a child's food that otherwise might not have been developed. The opportunity to fortify bread was not expected to solve India's nutrition problem but was effectively used to win understanding and support for the fortification principle and then provide a platform for innovations in mass-information programmes.

The slowly mounting awareness and the eventual policy pronouncement by the Government were in considerable part the outgrowth of skillful presentation by a handful of men of a few threads of information, a few pilot activities, and a few isolated informal statements of

officials and scientists. In short, people began—not by chance—to hear and read so much about the malnutrition problem and what was being done about it that they began assuming that this was a national concern and an activity of major proportions. The resulting reactions and snowballing involvements soon took on the aspect of a movement.[22]

(*3*) An important principle of bureaucracy emerging from the Indian experiment is "If the existing framework doesn't work, don't work within the existing framework". Too often, as at the start in India, attempts are made to fit a new far-reaching program into established institutions. When these programs do not neatly fit the pattern of that institution, the result may be to encounter hopelessly frozen attitudes and the crippling inhibitions they imply. It was recognized early in this program that the often unyielding mode of operation of the traditional ministry and research institutions was not conducive to new concepts and experimentation. To escape burial in the bureaucratic quicksand, new openings (for example, the Planning Commission group that embraced half a dozen ministries and the Protein Food Association mentioned earlier) were developed to meet the need—instead of tailoring the need to the existing institution. In the process, a number of existing organizations (although not in all cases their field services) were inspired to a nutritional commitment that led to productive contributions.[23]

(*4*) The Indian nutrition experiment may also shed some light on another question commonly raised in the development business. Is it best to introduce a new concept or program at the basic working level of the bureaucracy, with the aim of propelling a technically well-supported project upward in the hierarchy, or is it better to start at the very top and work for a trickle-down effect? The experience in this limited situation was that neither was the answer. Both were tried. The technical forces, although often highly qualified professionally, did not carry sufficient influence to move the bureaucracy. The ministerial level, although attracted to the political value of a nutrition concept, was until recently often so preoccupied that it could give no more than fleeting attention. It was the third attempt that finally worked. This involved, by design, a small informal, unorganized constellation of several enlightened businessmen and scientists, a devoted newspaper editor, and, most importantly, a few senior civil servants. These interested men never met as a group, in fact, in some cases they were not personally acquainted with one another. However, they were conscious of their

mutually reinforcing, interrelating roles—never formally articulated—which in the final analysis were responsible for the critical steps that led to a formal national policy and heavily budgeted programme.[24]

(5) The Indian nutrition effort has compelled attention to be paid to the sophisticated application of new technology, both scientific and managerial. Unlike the transfer of established materials and know-how for agricultural and industrial production, the use of subtle and complex modern technology to achieve leap-frog advances in developing societies is often talked about but is rarely applied, witness desalinization, atomic power, and satellite communication. Out of necessity to find substitutes for foods that richer nations already consider inexpensive—and out of necessity to find ways to penetrate the persistence of traditional food habits—India has made a beginning in applying the new nutrition technology.

Much of the success to date may be attributed to India's willingness to explore and experiment beyond conventional boundaries—notwithstanding the doubts and often the consternation of scientists and bureaucrats, both Indian and international.[25] Had Indian Government programmers heeded all the well-intentioned criticisms of such concepts as bread fortification, salt fortification, and the formation of an industry-wide action group, the momentum apparent today might never have materialized.

(6) Emerging from the Indian experience is the recognized need for a more systematic look at ways to improve a child's nutritional well-being. Over the years many solutions have been offered—from FPC, lysine and blended cereals to mothercraft centres. A set solution is easy to sell. It is specific; its costs can be detailed; its effects are measurable. This, however, may be looking through the wrong end of the telescope. Rather than start by examining specific foods or fortification possibilities, one should examine what a child eats, why he eats it, and how it gets to him. What are the points at which intervention in that delivery system is feasible—the points that are susceptible to modification? What are the incentives and disincentives that are at play? A slight twist of the market mechanism may mean more to the nutrition of a child than all the new foods that could be devised and produced. A shift in production incentives, retail-price policies, or ration-shop procedures may well be a major part of the answer.

(7) It has been recognized that the factors determining the success or

failure of nutrition projects often seemingly have nothing directly to do with nutrition. Among the practical questions that must be considered are the following:

> Is the proposed action politically attractive? And if so, is it sufficiently visible? How long will it take to see results? What are all the political implications, for example, how will various commodity interest groups react? Is the cost within the locally accepted realm of practicality? Will there be a requirement for foreign exchange? Is the project—or will it be—self-sustaining? Is it repeatable, and, if so, what are the prospects of imitation? Does the project involve other countries, systems, or institutions that could bring embarrassment to the government? Are all the raw materials, equipment, and other necessary related components available? And are all the necessary related services in place: transport, packaging, storage, and marketing–distributing capacity? What are the long-range effects? Does the project better equip the poor to cope with development opportunities? What is the relationship to other programmes? Is there a linkage between this and the family-planning activity? Does this provide additional employment? Is there an educational dimension to the programme?

There is also a series of practical bureaucratic questions:

> How able are the people in charge? Do they have the commitment and the muscle, without which approval and allocation mean little, to push the project through? How many officials are involved in the clearance procedure, and how long will that procedure take? What are the administrative constraints, once the project has been approved? What other problems can be anticipated, for example, what is the potential corruption factor?

"Modern Bread" was selected as the first fortification venture in India —in part, because it was easy, quick, inexpensive and visible, and required the involvement of relatively few people. In looking at alternatives, there were more important ways to improve Indian nutrition. One obvious approach would be to grow more pulses. But this implies changes in land use and, as such, risks controversy. In looking into the pulse possibility, it was soon learned that many officials would be involved—formally and informally—in the decision-making process. Also, it became evident that relevant, reasonable but non-nutrition-oriented considerations would weigh heavily on their attitudes. In the case of "Modern Bread", a new policy meant the concurrence of the Chairman (who was also the Secretary of Food) and the Managing Director, and those attempting to stimulate nutrition in India opted for reality. One begins with the possible.

(*8*) The Indian experience has demonstrated that at a certain stage nutrition problems become less the domain of technology than the

domain of administration.[26] Patient research and experimentation by the scientific community are obviously critical. However, the programming or operational element, often overlooked in the past, is being increasingly recognized as another essential to the success of such a program. The biggest difficulties are no longer technical or clinical problems; they are budgeting, managerial, logistical, and marketing problems. Solving these requires different talents, different temperaments, different skills—often a combination of skills that straddle the traditional disciplines. Some of these qualities must be developed, virtually without benefit of precedent.

(*9*) Another feature worth noting is that operational evaluation is almost always included in the program activities. An experiment, by definition, will include failures. Too often in the development business, however, programs may go on for years without any objective measurement of how well they are working or with an academic evaluation that is not helpful to programming and decision-making. Nearly all the Indian nutrition activities have research elements proceeding at the same time.[27]

Also of research interest is the recognition by some observers in India that further expansion of the nutrition program hinges not so much on answers to medical problems as on answers to social-science problems.[28] Nutrition need has raised basic questions about income distribution, resource allocation, and the nutritional implications of agricultural policy. A few government leaders are beginning to think of nutrition in terms of such issues as the extent of increased productivity of the properly nourished man, the added contribution to society by a child with full mental and physical capacities, the costs of malnutrition to the country through waste in bearing and rearing children destined for early death or through relief for those whose productive years are curtailed, the social and political implications of malnutrition and the implications of better nutrition for family-planning.[29, 30] Encouragement of major research undertakings elsewhere to examine these heretofore neglected issues would not be misdirected.

(*10*) Finally, the Indian program offers a lesson in modern foreign aid. In addition to the points above, many of which bear on aid techniques, the Indian experiment suggests the need for a blend of the almost random "target of opportunity approach" of the early years ("What can I do to be useful?"), and the much more "goal"-oriented approach of later years,

which, if followed rigidly, often did not work either—especially in new project areas. Given a goal firmly fixed in mind, there must be the flexibility to make use of the opportunities.

The Indian nutrition experience perhaps has brought into being an example of a new style of technical assistance. It offers an illustration of a direct problem-solving approach, with all the broadness of operational scope this implies. Indian specialists as well as their foreign counterparts have pursued problems that cut across the classic functional sectors—and departmental organization charts—of development programming.

The past few years in India have also demonstrated that in many cases the foreign specialist can contribute most by focusing his energies on the problems and decisions that face the policy-maker, rather than the technician. This indicates a possible need for re-evaluating the criteria currently employed to recruit officers to serve abroad.

To the extent that foreign assistance has helped in the experiences described above, an essential element has been the welcome degree of autonomy which the parent organization has allowed officers operating innovative and fast-moving programs in the field. This has avoided the unfortunate limitation in programming that has resulted when aid agencies, including international organizations, have sought to control decisions from far-off headquarters.

The recent Indian experience also demonstrates that the academic and research institutions of industrially and advanced countries can make a contribution. This contribution, however, has been limited in part because of a tendency to espouse from afar formulas for remolding traditional societies. Solutions that appear theoretically sound from a distant laboratory often turn out to be unfeasible in the context of the highly personal, highly traditional, and socially motivated eating habits of a developing society. Hence the usefulness of foreign research efforts will be enhanced to the extent they interact with the realities of the operational problems and programs overseas.

Programme implications

What began as an experiment now forms the beginning of a national programme. The Indian experience is significant for its scientific achievements and applications of technology. Perhaps more important are the

underlying reasons why these programs have been taken up and the innovative approaches employed in implementing them. Their adoption reflects the fact that serious thought had been given for the first time to the developmental ramifications of malnutrition, to the economic dimensions of the problem, to the vote-getting appeal of nutrition in a democracy, to the national planning implications, and to the evaluation of alternative cost solutions. A first attempt at the latter was the Comprehensive Nutrition Plan presented by the Ministry of Health in 1967. Although in retrospect it was not as inclusive as some would desire, it was to my knowledge the first attempt at an analytical systems approach to meeting nutrition needs.[31, 32] Plans are well advanced for a more sophisticated study of "delivery systems" to be conducted in the state of Tamil Nadu.

India's experience is also significant in that it suggests that it may be possible to provide in a very poor country levels of well-being that western nations were able to achieve only when much further advanced in the industrialization process. India has been able to achieve a 50-year life expectancy at its current national income *per capita* of about $70. Life expectancy in the United States reached this level only when the comparable value of income *per capita* was twenty times as great. The major difference is that, unlike 1910, when the United States attained its 50-year expectancy, there are today effective, easy-to-administer, and very low-cost means of controlling traditional epidemics. The same concepts may be applied to improving diets. Food fortification may some day be the equivalent of a smallpox vaccination. The required ingredients are modern technology, sound organization, innovation, and concern.

Notes and references

1. The message to Parliament accompanying the Prime Minister's 1970–71 Budget (issued on February 28, 1970) stated: "The Government of India have, therefore, decided to give high priority to the problem of nutrition among children in the Fourth Plan." For the first time, a special section of a five-year plan is devoted to the subject.
2. Berg, A. D.: Malnutrition and National Development. *Foreign Affairs,* 1967: XLVI, 126.
3. Eichenwald, H. F., and Fry, P. C.: Nutrition and Learning. *Science,* 1969: 163, 644.
4. Malnutrition—directly and indirectly—is responsible for more child deaths than all other causes combined. In India, it contributes each day to the deaths of approximatively 6 000 youngsters 5 years of age and younger.

5. Ahuja, S. P. *Monthly Commentary on Indian Economic Conditions* (and unpublished supporting data). Annual Number, December 1969, p. 143.
6. India's wheat production, the major beneficiary, by 1971 had increased by 79% over the 1961–65 averages. Rice production during the same period has increased by 19%.
7. Gulick, F.: *Nutrition Data Reported by State Nutrition Surveys in India, 1963–1965: A Summary Note.* AID/India Staff Research Memorandum and Accompanying Tables, March 1969.
8. For India, this brings up the issue of whether the damage to mental development caused by malnutrition is reversible or irreversible.
9. These calculations ignore unequal distribution within the group and within families. If, as we suspect, the deficiencies in pre-school children are proportionately greater than in other family members, double or even triple that income may be required to eliminate most of the deficiencies—and even then vitamin-A and perhaps iron deficiencies would remain. If the average *per capita* income of 162 million people does not reach the minimum level until the year 2000, it may be 20 years beyond that before the average will be high enough to meet the average pre-school child's nutritional requirements. And that will still be the average.
10. Ladejinsky, W.: The Green Revolution in Punjab. *Economic and Political Weekly* (India) 1969: 4, A73.
11. *Survey Report of the Bakery Industry in India.* Marketing Research Corporation of India, New Delhi, 1969.
12. *Food Habits Survey Conducted in Gujarat and Maharashtra.* Operations Research Group, Baroda, Gujarat, India, December 1969.
13. The influence of "Modern Bakery" in this is difficult to measure, but it has undoubtedly been significant. Breads are more hygienically prepared and wrapped in response to the standards set by "Modern Bakery". The major bread producers are beginning to emulate "Modern Bakery" by introducing fortification into their products and, perhaps equally important, are following its example and stressing better nutrition in their advertising.
14. *Report on Identifying Regions of India Suitable for Introduction of Fortified Rice.* New Delhi: Mansinghal Associates, March 1969.
15. *The Protein Emergency.* Ahmedabad, India: Indian Institute of Management, 1967.
16. *Food Habits Survey Conducted in Gujarat and Maharashtra.* Operations Research Group, Baroda, Gujarat, India, December 1969.
17. Wheat and rice have received most of the attention devoted to upgrading the protein level of cereals. The survey concluded that the people who need help most eat sorghum and millet.
18. Efforts are also being made to exploit the lunch menus to meet other nutritional objectives. The school feeding network, for example, is being tried as a channel for nutrition education. The Minister of Education has encouraged a systematic study designed to lead to a major nutrition education activity.
19. Roy, P., and Rath, R. N. (eds.): *The School Lunch Program in Orissa,* New Delhi, India: Council on Social Development, 1971.
20. The *Children's Charter,* as finally proposed by Prime Minister Gandhi, would be financed by a 1% levy of all government taxes and would not detract from the existing education budget.
21. In addition to those described above, others are being pursued—with varying

degrees of success. Indian scientists are pushing ahead with research to develop higher-protein seed varieties. The Government recently approved a $140 million program designed to improve the quality and quantity of urban milk supplies. Cottonseed, historically used for animal feed, is now being processed for human consumption. Soybean, which is high in protein but was virtually an unknown crop in India 4 years ago, has been introduced, with yields per acre rivaling those of the United States. To encourage production, a decision was taken by the Government earlier this month to give price support to the crop. (Facilities necessary for processing the soya, however, have not received the same attention.) A milk substitute to be used with tea, which is how most Indian milk is consumed, has been successfully developed, using oilseed as the protein base. As in several other countries, early research is under way on fish-protein concentrate and on protein from petroleum.

22. In our new interest in sophisticated model building, we must not lose sight of how, in fact, major decisions are often made. Decision-makers in all countries are mortals, subject to the same emotional interests, anxieties, and reactions as others. Many programmes, universally, are the result, not of econometric analysis, but of basic human appeals, of political concerns, and of personal institution.
23. In addition to the more obvious substantive Ministries (Food and Agriculture, Health, Education, Industries, Information), the involvement also included the Ministry of External Affairs, which last year initiated an action-oriented nutrition resolution in the United Nations General Assembly.
24. Once political leaders recognized the political attractiveness of the movement, they became increasingly interested. However, with the one outstanding exception of Mr. C. Subramaniam, a former Minister of Food and Agriculture, the political leadership followed rather than led in the events described here. It is of interest to note that, once the "new" wing of the Congress Party had adopted nutrition as a major item in the party programme, the opposition or "old" Congress a few days later also introduced nutrition into its programme.
25. A major part of this problem has been the inability of the scientific community to speak with one voice. The often conflicting technical advice offered to public officials has not aided the decision-making process.
26. Berg, A. D. and Levinson, F. J.: A New Need: the Nutrition Programmer, *Am. J. Clin. Nutr.* 1969: 22, 893.
27. These have compelled attention to be paid to life-styles and the needs of specific age, income, and geographic segments of the population. In the process, officials are beginning to abandon often misleading averages and aggregates that had commonly been used.
28. Berg, A. D.: Priority of Nutrition in National Development. *Technol. Rev.*, Boston, Mass. Inst. Technol., 1970, p. 44.
29. The relationship between nutrition and population growth is particularly intriguing. It is now being suggested as an hypothesis that better nutrition increases the survival rate of children and in the process induces parents in traditional societies to accept the idea of conceiving fewer children. Another dimension to the nutrition–population relationship is that nutrition programmes, while improving the health of the child, reflect the concern of society for the well-being of that child; hence, preliminary studies suggest, nutrition programmes may increase a mother's receptivity to advice on family-planning.

30. Berg, A. D.: Toward Survival: Nutrition and the Population Dilemma. *Interplay*, 1970: III, 24.
31. *Comprehensive Nutrition Plan*. Government of India, Ministry of Health (working document), 1967.
32. Berg, A. D. and Levinson, F. J.: Combating Malnutrition: A Working Model. *Intern. Development Rev.* 1968: X, 15.

Part IV
Consensus

All the lectures presented in this volume were followed by discussion. No attempt was made to record the interventions of the individual participants. The task of summarizing the highlights of the discussions was entrusted to two members of the seminar, who had very different and thus complementary backgrounds: economics and paediatric nutrition.

The View of the Economist

By GÖRAN OHLIN

It is a very bad habit of economists to say "on the one hand—and then the other". But I have to admit that there has not been only consensus in our discussions. There have been divergencies as well, and it is important to draw attention to them. One point, however, on which I think there will be consensus is that we have listened to a most impressive set of papers which have altered our views on many things. We have received a remarkably full, in some ways discouraging and in some ways encouraging picture of the state of affairs, the prospects, and the agenda for action in the nutritional field.

My summary will inevitably be inadequate; it is almost presumptuous even to try to summarize in this field. Nutrition is a diverse and heterogeneous theme, and this has, of course, been reflected at this meeting. However, much of what has been said deals with the case for doing something and doing it soon. We are all here because we are convinced of this case, and there is perhaps no particular need for me to dwell on it. But I think it is important for us all to have some idea as to whether it will seem convincing to others, some assessment of the strength and weakness of the arguments that have been put forward.

I believe that, deep down, we all feel the case is very simple. It is a humanitarian case, first of all. But nutrition must also be seen in the context of the present crisis of development, which is due to the fact that many approaches to development have been tried in the 'sixties and found wanting. We shall simply have to try other ways. As Professor Vahlquist said, quoting Mr Boerma, nutrition seems to mock the achievement of economic development. There is a widespread feeling that what is needed now is a humanization of the development process, and for that matter a humanization of our ways of thinking about it.

In the case of nutrition, it is a circumstance of great importance that the children occupy the centre of the stage. This adds human poignancy to the sufferings of malnutrition, and it also lends special strategic significance to anything that can be done to relieve it. The next generation is the hinge on which the process of change turns. This is

also why the relationship between nutrition and mental development, which has been brought up here in both general and specific contexts, is of such immense importance. Dr Sai stated that 40 to 50% of all the children in his country pass through some phase of PCM. This, as he said, is a terrifying statistic.

The idea of development strategy is highly fashionable, and in the making of such strategy there is every reason for concern with nutrition. Many of the papers have brought out the fact that development will usually tend to be nutritionally destructive in the transitional phase. It is thus far from true that development automatically solves the problems of nutrition—instead, it may aggravate them and is in fact almost bound to do so, unless this tendency is firmly countered. The commercialization process, which is inevitable in the course of development, brings a number of these harmful effects in its wake. Simply to prevent deterioration in the future, it is therefore necessary to adopt a great number of regulatory measures. The *feasibility* of such measures is in itself a strong argument for taking them; if something can be done in this field, it probably should.

However, it seems to me that we still have to prove to others what is an article of faith with us, namely, that there are things that can be done to improve the above-mentioned conditions efficiently. I certainly believe that there are, but there are audiences which require more elaborate arguments to be convinced. Dr Savosnick reminded us that in ministries of planning and development there will be a call for hard-headed calculations. Such calculations can be extremely effective, whether they refer to the budgeting costs of governments or to the costs to society as a whole. I myself am convinced that, as arguments, they will stand up, but it is obvious that much remains to be done in the field of cost-benefit calculations. This is an area where economists should be able to make important contributions.

There is another strong argument to the effect that bringing down mortality will stimulate the transition from high fertility to family-planning and contribute to the mitigation of the population problem. This is a hypothetical argument. We have not so far seen this process clearly and conclusively demonstrated in practice, but it is, nevertheless, a plausible and compelling argument.

It probably depends very much on the circumstances if these and other arguments should be brought out in defence of the case for nutri-

tion. For most purposes, I believe the simple case is better than the complicated, and I suspect that the straightforward human appeal of our case is so great that there is usually little need to confuse the issue by speculations about all the conceivable and far-ranging implications of nutrition for social development.

Let me pass to the question of what can be done. We have discussed a vast array of types of interventions, and naturally so. Every aspect of the production, distribution, processing and, for that matter, consumption of food is touched upon in the nutritional sequence. It covers both the harvest and post-harvest range that Professor Aylward referred to. It cuts across all lines of academic demarcation. There is a risk of getting lost when almost anything that happens in society has some bearing on our problem. I shall only try to categorize the types of suggested measures in a very simple way.

Some fall within the scope of *general development policy*, because almost anything that is done to raise productivity, especially agricultural productivity, is of direct relevance to nutrition. Whether it is a question of agricultural credit, irrigation, land reform or transportation, such measures aim at increasing productivity and food supplies. But this field of general development efforts is already well recognized. It leads its own life; it has huge resources at its disposal. Nutritionists and advocates of nutrition policies may be able to contribute to development policy by calling attention to the risks of undesirable implications which I have already referred to. I would nevertheless argue that this is not an area on which nutritionists should spend their energy. For one thing, rural development can easily become very controversial, and it would be unfortunate to link nutrition too closely to causes which somehow or other get bogged down, for reasons which have nothing to do with the value of our own case. If, for instance, we consider how enormously controversial, difficult, and central to the political life of many countries questions of agricultural reform tend to be, I think you will agree that, no matter how important these things are, it would not be wise to harness the nutritional cart too closely to that particular horse.

Moreover, my general feeling is that what gives such special interest to what nutritionists are saying is that it suggests the possibility of doing things *ahead* of development at large. This does not in any way reduce the importance of the increase of overall prosperity which

general development policy aims at, but the specific insights of nutritional science add something new and distinctive which ought to be underlined.

A second type of measure which is of great importance to our subject is those which lie in the realm of *commercial regulation*. The commercialization of the food trade and the food industry is, as I said before, inevitable. We know that, in all processes of development, these have been among the first to be affected, and it is rare by now to find communities which are not affected by the cash nexus. These developments call forth well-known efforts by government. There must be some regulation of the markets, and it can be more or less active. There must be legislation to cover the food-processing industries, there must be control and evaluation of their products, etc. These things are bound to come everywhere. We have things in our favour here, as this type of intervention is generally accepted. The effort to get it sooner rather than later may not be great, it is not expensive, and it belongs to the standard arsenal of government legislation and regulation all over the world.

I come then to the *specific traditional measures* in the field of nutrition. They include clinical work in MCH or rehabilitation clinics, extension work, school lunches, education both of children and adults, etc. All these measures are aimed precisely at improving the nutritional situation within the present constraints of the economic situation without waiting for the remote benefits that may flow from a growth of 2 or 3% per annum in *per capita* income. This is a traditional field, and it seems to me that one of the questions which has not been answered at this seminar and which no doubt is extremely difficult to answer is how fast results can be expected to be forthcoming by these methods. If we are to expect great results, we shall undoubtedly have to be immensely attentive to evidence of feasibility and to accounts of improvements and successes.

Finally, there are a number of *unconventional measures*. As Alan Berg emphasized in his discussion of the strategy problem in India, there are some levers which affect masses of people but which can be pulled at central points, so that the difficulty of moving mountains is avoided. He mentioned, for instance, the fortification schemes tried in India. One limitation of such measures is that they reach only special groups. This is not, it seems to me, an argument against them, but it clearly

limits their usefulness in cases where the commercial sector is still very small.

Then we have the possibility of manipulating agricultural planning, price structures, and economic policy at large with specific nutritional aims. We have had some discussion of such possibilities. Some speakers have pointed to distortions in present price and production structures, which give the impression of sheer lunacy. However, in these matters there is, all too often, no meeting of minds between the economists and the nutritional community. Sometimes it is undoubtedly true that economic planners commit serious mistakes from a nutritional point of view or from other points of view. One of the aims of economic policy is to correct the irrationality of the economic system when left to its own devices. It is possible that in many cases one should, as it were, put a much higher price on protein than the market allows for. Whether or not one lets the market price rise, one should in one's planning be aware that what economists call the "shadow price" or the true value should not be the same as that which is found in the market. It is then also obvious that the gross national product, to which the economists are accused of attaching undue attention, does not adequately express nutritional values. It makes no allowance whatsoever, for example, for the production of mothers' milk, which we know to be most important.

At the same time, I must insist that many of these issues are rather more complicated than they are sometimes thought to be. It is not likely—and for that matter not even possible—that the entire economic system can be judged only from the standpoint of nutritional value. This is something one has to face. Here is an area of inquiry which must be explored. Our discussions have drawn our attention to the problems and I hope something will come out of that.

Among the unconventional approaches there are, of course, many others. Above all, we expect much from research in the long run. I need not go into that. We have also touched on the problem of whether food aid can be used in a helpful manner.

I shall not try to assess or evaluate these various ways of doing something about nutrition. I shall pass instead to the question of how we can cut through this impossibly confusing array of problems, ranging from the most general to the specific. To me, a particularly encouraging aspect of this meeting was the general agreement that the crucial problems now are administrative ones. We seemed to feel that we know

a fair amount about the nature of the problem and that we have a great number of conceivable steps to take. The question, then, is really how to change the world with this knowledge at hand. The great variety of possible policies and measures is frustrating, but this is not unique to nutrition. These days the most important problems in the world all engage more than one ministry, more than one discipline. This is an age of interdepartmental committees and confusion. These problems of bureaucracy are a common denominator for us all, perhaps more than anything else. We have found that in this respect it is the same the whole world over.

To take two large issues which have come to the fore in the world in the last decade—family-planning and environmental pollution—both of them are very much of the same character as nutrition in that they engage and involve people from all possible disciplines and from many different ministries. Much can be learned from the way in which these issues have come to the fore. It illustrates rather well the scheme in which recognition is followed by commitment, which, again, leads to policy implementation.

One similarity between these issues and nutrition is thus that the recognition stems from scientists who have pointed out what is not apparent to the naked eye. The scientific community or some segment of it has been particularly instrumental in convincing national and international authorities of the seriousness of the situation. In this first stage, when recognition is at stake, we must, as many speakers at this seminar have said, mobilize any and all existing support. It may be a matter of chance where such support can be found in a country. I would, however, argue that by far the most likely source will be the clinical nutritionists. They are the ones who are best fitted to sound the alarm bell in this particular case. The medical and public-health community generally are and will continue to be immensely important. Dr Jelliffe suggested in his paper that the first task might well be to convince the public-health community itself of the importance of nutrition. I do not know how easy that is going to be—my impression from family-planning is that, all over the wold, the medical community as a body has certainly been the most conservative and the most negative, although a small segment of that community was among the pioneers.

What should such a group of supporters do? On this point, there was agreement and consensus. "Community diagnosis" in the form of

various surveys is absolutely imperative. As an outsider looking chiefly at the political implications of such surveys, I think that these surveys should, above all, be quick. Statistical accuracy cannot be absolutely crucial in this context. I am reminded of the prime minister who asked the head of his statistical office, many years ago, before all countries had statistics of their gross national products as a matter of course, to produce an estimate of the gross national product by tomorrow. The director of the statistical service threw up his hands and said, "That would be impossible! It will take at least two years". The prime minister said, "Excellent, then it will take two years for someone else to prove that your figures are wrong." In our case, the fact is that the general picture of malnutrition is well enough known to us and to most people in the field. The purpose of local surveys is to dramatize it, and to bring home to the people in every country the fact that the problem is here—it concerns us, not just someone else. We should not underestimate the need for this. We learned in family-planning that each country simply has to undertake its own studies and surveys and convince its own people. The fact that something has been shown to be the case in almost all other countries is not enough for the political system as evidence that the same thing is true in the country in question.

In politics, repetition is immensely important. One has to hammer one's point home again and again, and one has to have something to say. This is why surveys, apart from the fact that they may bring up unexpected facts, have a primary political role to play. We have now and then noted that nutrition has to become a political issue. But how one makes political issues is not easy to generalize about. Accidents may help, but we do not wish for famines simply in order to dramatize the question of nutrition. However, some things are working for us. I think international example is important in social policy, and the fact that interest in nutrition is gathering momentum internationally will gradually make things easier.

Next, nutritionists need a platform or a bridgehead outside the strict field of clinical nutrition. They have to bring in, as early as possible, other types of people who have something to contribute. Historically, the papers we have heard this week have confirmed the role of institutes, university departments, etc., perhaps preferably outside the governmental machinery proper, but in any case wholeheartedly committed to nutrition.

Ultimately, of course, the question is how government and politics are drawn in. There, the law of least resistance is the strategic rule. As in a military campaign, it is impossible to specify in advance where the enemy lines are going to be weakest. As Mr Berg reminded us, all means are permitted and one has to be alert to the opportunities. Feasibility must indeed be the criterion. I do not think that it serves much purpose to discuss which of the relevant ministries should first be brought into action or where the chief responsibility should lie. It will all depend. Mr Berg also told us how resistance, in his case from the Ministry of Health, persuaded his team in India simply to give up on that front and to try something else.

Nor do I think that much is gained by recommendations for co-ordination, whether of national bureaucracies or international organizations. Co-ordination is in all too many cases the origin of confusion, and it is sometimes a good way of making sure that nothing gets done at all. It is true that interesting devices have been used in the public administration of nutrition. I am thinking of the nutrition boards or commissions. But in Nigeria, for instance, much has been achieved without such an arrangement and it seems to me that we could not, on the basis of what we have learned this week, come up with any general recommendations or general rules on that score. What is clear is only that eventually there will have to be units or at least individuals in all the departments concerned, who will constitute the prime movers of an integrated programme, though not necessarily a co-ordinated programme. The important thing is to keep things moving and the fact is that we are simply too ignorant to say what should be done first—whether, for instance, one should hold back action on school lunches in order to put a priority on baby foods or the other way around.

We have learned, if we did not know it before, that it is difficult to get money out of treasuries for any purpose, good or bad. Even small funds are sometimes exceedingly difficult to obtain. This is, of course, relevant when you are discussing whether you should start in a small way or with a big bang. You may be able to do more with an emergency programme, if you can pull it off.

In the family-planning field, it became apparent in the middle of the 1960's that it was necessary to devise an entirely new strategy. The old clinical approaches had not worked very well. It was easy to show that in some cases people had worked for years on clinical lines with hardly

any results and at astronomical cost. For five years now, some countries have operated entirely different types of separate and aggressive family-planning programmes. In some cases, they have grown to very large proportions and have become very expensive. At this point some disenchantment is undoubtedly setting in. It is difficult to keep such a large organization going at fever heat all the time, and the feeling now is certainly that family-planning must be integrated with the public-health service, wherever possible. This leads me to one general rule, which is that existing services are terribly important. One would, in most cases, be wasting one's energies if one tried to duplicate or set up a similar network on the outside.

I have said that it would be futile to recommend general principles, but something can be said. A great many of the things to which we attach importance are things which will come anyway, which will have to be built up as a part of the regular government machinery. They do not require much special fervour from the nutritionist community to prove their absolute indispensability. On the other hand, Alan Berg, in his fascinating report on India, illustrated the possibility of entirely different strategies. They are not necessarily the right ones for all countries, and others like them will have to be tried elsewhere. Here imagination and energy can be expected to give results.

Dr Jelliffe, talking about public health, emphasized the need for an "adapted public-health programme" with a new and different conception of public health. As you know, a similar discussion is going on in the field of education all over the developing world. The educational concepts and traditions that were taken over from the colonial powers or from the developed world generally have clearly failed to do anything like what was expected and hoped for. Right now, people may be mostly thinking and talking, but a great deal of experimentation is also going on. What one would hope to see in nutrition is more of this readiness to try everything, including many things which have never been tried before.

What we also need is a new kind of man, a new profession, that of "nutritional multimaniac". Where is he to come from? At the present time, nutritional multimaniacs arise simply by accident. I think that they should be produced, and I think that, in the training to which everybody, naturally, attaches much importance, one has to try very hard to be "interdisciplinary". I am not sure that that is the right word,

for it is also a question of creating a new discipline. In that context I wonder if there may not be a need for a new forum—a new journal, not for clinical nutrition, for which there are quite a few, but oriented specifically towards nutritional policy. Of course, we must also take an interest in nutritional developments in countries like China and Cuba, where social policy is enormously experimental.

The role of aid and assistance has not been touched on very much. It has, however, been emphasised that aid has been very useful in the creation of institutes, serving as nuclei for the awareness of nutritional issues. One of the troubles of international aid, however, seems to be that nutrition has great difficulty in competing with other uses of aid. Many international agencies declare that they want to provide new resources for nutrition but that no one ever asks them for it. The chief explanation of why no one asks for it is that donor agencies also ask what the recipients would like to give up for nutritional aid. It does not receive the first priority, but usually only the third. But only the first and second projects are likely to be financed from one particular source. If one is convinced of the priority of nutrition, it is therefore logical to fight for policy devices which make nutritional aid additional. One such device is that suggested by the Secretary-General's panel, namely, a special fund in the UN system in analogy with the population fund. Bilateral aid programs could very well adopt the same principle by earmarking some funds for nutrition. This could of course, become a controversial issue. It means a certain amount of dictation to the recipient, who might, in some cases, feel that such intervention is a tying of aid, although a different kind from the one we are usually concerned about.

Finally, a few words about the time scale. We are all impatient to see results. But I think it is quite clear, from our experience of development at large, that, even if we are successful, results will not come very fast. In family-planning, I have already mentioned that a very considerable effort has been undertaken for the last five or six years. Yet estimates suggest that the number of births in the developing world is at most about 1% smaller as a result of this. This is undoubtedly not very impressive. But only a few years have passed and such findings do not disprove anything. They should not make us lose heart. The trouble is that they tend to result in political disenchantment. If we manage to work up an enthusiasm for nutrition, we must be prepared for a

backlash. Boredom will set in when the effort does not produce in five years what it is only legitimate to expect in 25 years.

But this seminar and the developments which have been reported here confirm that there is a ferment in this particular area. There is a favourable wind which it is important to catch, and when we go back to our various countries, we shall be able to set to work immediately, without waiting for the next seminar on nutrition.

The View of the Paediatric Nutritionist

By DERRICK B. JELLIFFE

Many of the things that can be said about this seminar have been said very much better by Professor Ohlin before me. Much of our problem is historical and some of it is possibly semantic, so let me start off by commenting on this, because it may perhaps help.

During the meeting, we talked about different persons' perceptions of elephants. How would a nutritionist look at an elephant? I think an old-fashioned one-eyed nutritionist might look at an elephant as a collection of steaks walking about on legs, whereas a modern type of nutritionist would see the elephant not only as a source of meat but also as a very complex creature in a whole ecosystem. In fact, the modern nutritionist is concerned with much more than food, he is concerned with a whole wide spectrum of events in the ecology, which we have heard about during this meeting.

One of the problems is that nutrition is a very difficult and abstract concept. Mankind has understood the need for food for hundreds of thousands of years; whereas the idea of nutrition, the idea that certain types of food can lead to health or ill health, is a very modern and sophisticated concept.

Too frequently, nutritionists are considered exclusively either as cookery experts or, alternatively, as laboratory professors working away on "Cloud 9" on some abstract aspect of biochemistry. Biochemistry is included in "nutrition", as is cookery, but there is an awful lot in between.

Thus, semantics has played a great part, I think, in this whole confusion. People understand food, but the concept of nutrition is difficult and new. It is intangible and difficult to demonstrate and falls between (and into) many different areas of science. In fact, you may say that the nutritionist has to be a bridger between different groups and be-

tween different sciences, with a practical purpose—the improvement of human nutrition—as his objective.

To me, as a nutritionist, this seminar has been exceptionally interesting and important. Firstly, it has been important for us to appreciate the problems that the planners, the economic specialists, and the administrators have. In a sense, you may call this seminar a "cross-cultural" meeting in many ways, because of the various streams of thought and discipline represented. Various subcultures have been giving their "inputs" here and the nutritionists present have learned much from the gathering together of such experienced and high-level colleagues in administration and in economics from the various parts of the world.

It is now perhaps necessary to consider what should be done as a result of this seminar, bearing in mind the sheer numerical size of the problem. What can be done? What should we do now? What should we aim at? How can we go about trying to weave our way through the complexities to achieve some useful benefit? Are there signs of optimism? Are there signs suggestive of pessimism? I think there are both, but I also think that a practical view of the present situation concerning food and nutrition in the world will see much that is hopeful, as well as cause for concern.

Now, what are the different areas that we have covered in the seminar and what can we get out of these in terms of *practical guidance*? Well, the first thing to appreciate, I think, is that there is *a new body of knowledge which has arisen in all of these different fields.* Secondly, there is ferment going on at the present moment in many parts of the world—*new methods are being tried out and new successes are being achieved.* I think perhaps that we do not pay sufficient attention to the fact that there have been advances in the food and nutrition field of a practical nature. As an example, I would draw your attention to the fact that in the near future a meeting is to be held in Zagreb, at which the results of the programmes concerned with young-child nutrition from different parts of the world are to be presented. Many of these show positive and definite advances, both as regards cost and benefit.

The main topics discussed at this seminar can be divided into three groups—*food supplies, education* and *health services.*

In the *food-supply* area, obviously this extends through many different aspects and components. But there are certain things which have been stressed here which possibly governments in parts of the world may not

be sufficiently aware of and it is one of the functions of a meeting like this, and of nutritionists certainly, to draw the attention of governments to these things, which give considerable hope for improvement. I am referring to the advances in the genetic field, as far as the new varieties of crops are concerned, the possibilities of innovations and the actual advances in the field of intermediate food technology. Major emphasis should be given, as far as research is concerned, to these new approaches. I am particularly impressed by the emphasis which has been given here to the *need for research into legumes,* including the idea of an international or regional legume-research institute. Legumes play such a tremendous role in world nutrition and yet are almost universally regarded as low-status foods.

We have heard from Mr Berg about another type of approach which is very appealing and which, under the appropriate circumstances of central processing and an urban-type of cash economy, may have a wide effect without tremendous economic input and without major changes in food attitudes, which can very often be difficult to bring about. This is what was called the "carrier" approach to nutrition improvement, for example, the *fortification* of margarine with vitamin A.

The *influence of the commercial food industry* is something which—as Professor Ohlin has mentioned—we need to bear very much in mind. We have to realize that this influence may be positive and it may be negative. It may be negative temporarily or it may even be negative for a much longer time.

In my opinion, and I admit I am biased in this regard, the question of the most *rational development of the food industry*—and I say "rational" in terms of the food industry in a country and also in terms of foods which are imported from commercial concerns overseas—is a very important item which should figure prominently in considerations of food and nutrition policy in any part of the world. It is interesting to note that there is now in India a committee concerned in the rationalization of the food industry in this huge country.

You must forgive me if I mention the question of *human milk* again, because, as a paediatrician, I see this perhaps more directly, as I am immediately confronted with problems of child malnutrition. The production of human milk and the fact that it is disappearing from some parts of the world is a matter of the greatest public-health consequence, and possibly one of the most under-appreciated public-health problems

in the world at the present moment. Should this trend increase, then we will undoubtedly be in very considerable trouble indeed, for not only will this lead to a rising incidence of young-child malnutrition but also, as has been mentioned in this seminar, the question of breast-milk substitutes will arise, with complications in the fields of hygiene, economics and agronomics.

It is a strange paradox, if one considers that, all over the world now, the development of newer foods, sometimes prepared from very unlikely ingredients—grown on petroleum and made out of algae—is very rightly being pursued. At the same time, if one draws attention, as I am doing now, in very definite terms to the question of the decline of human lactation in the world, one runs a great risk of being dubbed as some sort of fanatic or faddist. This is surely a strange reflection on this whole situation.

The question of *food crops versus cash crops* has been much discussed here and obviously this is where the person with my type of background can offer little real advice, except that it would seem to me that some form of a mixture of the two is surely needed everywhere, with, however, usually more emphasis on local food production. An important approach is that of *marketing boards related to edible products,* as well as marketing boards for cash crops. All in all, with regard to food supplies, I think that there is great promise, that things are definitely happening and that there is a great possibility of using modern technology to improve the food supplies—in some of the ways that have been mentioned during this seminar and in some of the ways that I have mentioned now.

In regard to *education,* the main thing to me is really, as Professor Ohlin said, that there should be a re-thinking in relation to education of the general type and in relation to technical staff as well. The main requirement in the field of education now—whether one is thinking in terms of Africa or of the United States of America or of Europe—is for *staff trained for the actual need,* for their real-life function, and particularly the realization that a *large number of auxiliary staff* with a rather limited range are really what is wanted most. One of the matters which has been stressed at the present meeting is the need for *local training, using country and regional resources.* In the years that I have been concerned with the various aspects of this subject, either as a paediatrician or a nutritionist or whatever label I may happen to be

wearing, I have become more and more convinced that one has to weigh very carefully the danger of overseas training and even sometimes its counter-productiveness in not only wasting a person's time but also taking him away from assisting with the real-life problems in his own country. There is a need, sometimes never met, to undergo a process of what one might call "reversal", when he returns to his homeland after this training elsewhere.

Another conclusion which has come out of this meeting, I think, is that most of us are really in need of much greater *modernization in relation to methods of communication,* motivation, and putting ideas over to people. Most of us are trying to put over 20th-century ideas, using unimaginative, didactic, 19th-century approaches. These newer techniques in education and motivation may be of great importance.

In relation to the *health services,* it has been mentioned that surveys and the collection of convincing base-line data are the most useful activities. The question of the dramatization of results is very relevant indeed, but I would concur with Professor Ohlin that one has to be very careful, otherwise there may be a backlash if an issue is overdramatized in an attempt to put it over. Results should be dramatized for their actual worth.

At the moment, a considerable number of experiments with health services are going on in different parts of Africa and I would consider Zambia as the present-day pioneer in attempting to devise innovative techniques, based on science but also concerned with simplification, with outreach and with the use of modern knowledge in the circumstances of what may be termed "the shortage syndrome", that is, the shortage of money, staff, equipment, communications and almost everything else.

There are many experiments in progress to develop *adaptive MCH services* and quite a number of these are being costed and are turning out to be economical. It is necessary in this health-service approach to realize that the paediatrician and the medical practitioner may be as conservative and as funnel-visioned as any other worker. However, I think that this may be changing, because the paediatrician and the health worker are beginning to appreciate, slowly but definitely, that, although they may see the end-result—because the sick child comes to them—the other groups are needed to develop a logical, realistic, food and nutrition programme.

Within a health ministry, there is certainly a major need to have nutri-

tional guidance. There should, in my opinion, be a *nutritionist and a nutrition unit within the ministry of health.* This by no means excludes—in fact I think it rather reinforces—the need to have also *nutritional guidance within the ministry of agriculture.*

During the present seminar, we have surveyed here the problems and needs in some countries in Africa. We have also agreed that the social and economic consequences of food and nutrition are very real. Some of the economic consequences are definite and some of them are really at an extremely high level of probability, although needing further numerical proof. Recent practical and practicable scientific advances have been made in the fields of food and nutrition, food production, and communications that give us ample opportunity and ample information on which action can be based—sometimes quite uncomplicated types of action, which may have to be modified with further experience. There is more than enough information for us to actually work with now.

This brings us to the most difficult question of *intersectoral co-ordination* or interdisciplinary collaboration or integrated concern and whatever it may be termed. The need is really for some sort of human enzyme reaction, which can bring together the different resources from different ministries and within these ministries.

Thought also needs be given to the outcome of this meeting in terms of the direct communication impact it may have. To me, as an outsider, someone who has had the pleasure and privilege of living in various parts of Africa at various times, this is something that ought to be considered urgently. What impact can this seminar actually make? We have all heard of the big reports which tend to lie in dusty corners and do not have much effect. Is there any way that we can get the message across? If so, to whom, and if so, how? I think it is encouraging to realize that there is a great deal going on in this question of food and nutrition policy, not only in Africa but all over the world at the moment. To give you some examples, this is one of the top priorities in the World Health Organization, in the Pan-American Health Organization, in the Food and Agriculture Organization, and in the UNICEF. What is more, in the Americas at least, there are to be high-level seminars concerned with food and nutrition policy, which will be concerned particularly with the senior staff from planning and economics ministries and groups.

So I think that I may say that this is not just a question of fashion but rather of a genuine world-wide feeling of need and concern. Of course, as Professor Ohlin said, we must realize that fashions and changes in attitudes may be of a temporary nature. I think that we should consider the whole question of food and untrition, and especially policy and programmes, in a wider field than that of a country alone. For example, I wonder whether great emphasis should not be given through such continental co-ordinative agencies as exist, and in particular, of course, through the OAU.

It also seems to me that we should consider how best this seminar can have not only long-term effects in moulding the ideas, concepts and practices (and ultimately policies) on a national and international scale but also immediately—what impact can we make. I feel that the meeting should have the maximum amount of publicity through whatever media are thought most appropriate by the delegates themselves and definitely through inter-disciplinary channels, for example, the wide range of specialist journals catering for the interests of economists and development planners, of agriculturists and food technologists, and of nutritionists and health workers.

APPENDIX 1

List of Participants

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APPENDIX 2

List of Country Reports[1]

Standing, D. G.: Present Nutrition Status in Botswana

Tesfa Bushen, Yohannes Wolde Gerima, and Maaza Bekele: A Statement on Nutrition Problems, Policies and Programmes in Ethiopia

Roberts, G. J.: Nutrition Policies and Programmes in The Gambia

Sraha, J. W.: Agricultural and Medical Nutrition Problems in Ghana

Keriri, J. M.: Aspects of Nutrition in Kenya

Nah, N. N.: Report on Nutrition in Liberia

Ekpo, E. U.: Field Problems in Nutrition, Medical Implication and in Relation to Crisis, Rehabilitation and Reconstruction in the War-Affected Area of Nigeria

Maggidi, B. J., and Semiti, G. A.: Report on Nutrition in Tanzania

Siwale, M. V., and Vamoer, A. P.: Report on Nutrition in Zambia

[1] The country reports are available in a mimeographed volume, which can be obtained from the Dag Hammarskjöld Foundation, Övre Slottsgatan 2, S-752 20 Uppsala, Sweden.

APPENDIX 3

The UN Agencies in the Field of Nutrition and the UN Periodicals Devoted Wholly or in Part to Nutrition

Food and Agriculture Organization of the UN (FAO)

Headquarters (*Nutrition Division*): Via delle Terme di Caracalla, 00100 Rome, Italy

Regional Office for Africa: P.O. Box 1628, Accra, Ghana

Periodicals:

CERES: The FAO Review (bi-monthly). Subscription (one year): US $5

Nutrition Newsletter (quarterly). Subscription: free on request

World Health Organization (WHO)

Headquarters (*Nutrition Unit*): Avenue Appia, 1211 Geneva 27, Switzerland

Regional Office for Africa: P.O. Box No. 6, Brazzaville, Congo

Periodicals:

WHO Chronicle (monthly). Subscription (one year): US $5

World Health (monthly). Subscription (one year): US $5

United Nations Children's Fund (UNICEF)

Headquarters: United Nations, New York, N.Y. 10017, USA

Regional Office for Europe and North Africa: 20 rue Pauline Borghese, Neuilly-sur-Seine, France
Regional Office for East Africa: P.O. Box 7047, Kampala, Uganda
Regional Office for Nigeria and Ghana: P.O. Box 1282, Lagos, Nigeria
Regional Office for West Africa: P.O. Box 4443, Abidjan Plateau, Ivory Coast

Periodicals:

UNICEF News (published five times a year). Subscription: free on request

Assignment Children (quarterly) (from UNICEF, 20, rue Pauline Borghese, Neuilly-sur-Seine, France). Subscription (one year): US $6

World Food Program (WFP)

Headquarters: FAO, Rome, Italy (for address, see FAO above)

Periodical:

World Food Program News (bi-monthly). Subscription: free on request

Protein Advisory Group of the UN system (PAG)

Secretariat: United Nations, New York, N.Y. 10017, USA

Periodical:

PAG Bulletin (quarterly). Subscription: free on request

Dag Hammarskjöld Foundation Publications

Mass Education: Studies in Adult Education and Teaching by Correspondence in Some Developing Countries.
Edited by Lars-Olof Edström, Renée Erdos and Roy Prosser, 379 pp. Uppsala, 1970.

Sovereignty, Aggression and Neutrality.
Three lectures by Hans Blix, 64 pp. Uppsala, 1970.

The World Development Plan: A Swedish Perspective.
By Ernst Michanek, 71 pp. Uppsala, 1971.

The Image of the Developing Countries: An Inquiry into Swedish Public Opinion.
By Stig Lindholm, 100 pp. Uppsala, 1971.

In preparation

The Treaty-Maker's Handbook.
Edited by Hans Blix and Jirina H. Emerson.

The above are some of the publications issued by the Dag Hammarskjöld Foundation and distributed by Almqvist & Wiksell Bokhandel AB, P.O. Box 62, 101 20 Stockholm.

Nutrition

Sound nutrition is of decisive importance for man's well-being, learning ability and working capacity, but the full importance of these facts and especially their relevance for the development of the less-advantaged countries has been recognized only recently. Until now, the discussion of these matters has primarily been carried on in the medical profession and by persons working in the public health sector. The consequences of malnutrition are, however, of such a serious nature also from the social and economic points of view that they should be discussed in a much broader context and become the concern of policy-makers and administrators.

It was the growing awareness of how seriously nutritional deficiencies limit economic and social progress that led the Dag Hammarskjöld Foundation to invite a number of prominent African civil servants from ministries of agriculture, education, health, finance and planning to meet some of the leading international authorities in this field at a seminar in Uppsala in July 1971. The seminar had certain unique features. It represented a systematic effort to provide an opportunity for representatives of various ministries of this type to enter into an inter-disciplinary discussion of nutrition as a priority in African development. Greater attention than formerly was paid to the economic factors, marketing models and communication methods in the attempts to arrive at an integrated approach to the problems.

This book consists of the lectures delivered at the seminar. It is divided into three main sections: *Problems of Human Malnutrition*, *Factors Involved in Problem Solution* and *The Necessity of Integration*. Finally, an economist and a paediatric nutritionist summarize the proceedings of the seminar from their respective viewpoints.

The Dag Hammarskjöld Foundation was established in 1962 in memory of the late Secretary-General of the United Nations. Its purpose is to organize seminars and conferences on the legal, economic and social problems of the developing countries. The offices of the Foundation are in Uppsala, Sweden.

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